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INTEGRATED SCIENTIFIC RESEARCH FOR GLOBAL DEVELOPMENT

Seven Publicações
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Coloniality of biopolitics, eurocentric knowledges and decolonial genealogy

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Guilherme Ribeiro dos Santos Sena[1]

ABSTRACT

The proposition of this article is the continuation of a series of researches carried out by the author in the last two years, both in the form of a research project and an article in the publication phase. To this end, the method of critical analysis is used the decolonial genealogy or genealogical decoloniality, a way of approximating the analysis erected by the French philosopher Michel Foucault of the forms of exercise of power and the decolonial critical theory to modernity/coloniality in the figure of the Peruvian sociologist Aníbal Quijano. In this way, it was possible to identify how Eurocentric knowledge is formed and acts together with the coloniality of knowledge (Eurocentrism) as mechanisms for maintaining epistemic and racist prejudice. In addition, a new way of understanding the complexity of the forms of subjection/subjection within the colonial context was proposed in the figure of the coloniality of biopolitics, a form of exercise of the coloniality of power and biopolitics at the micro, meso and macrophysical levels.

Keywords: Coloniality of biopolitics, Subjection/subjection, Coloniality of power/knowledge, Decolonial genealogy.

[1] Undergraduate student in Psychology
Institution: Federal University of Rio Grande do Norte (UFRN)
E-mail: guilherme.sena.143@ufrn.edu.br
ORCID: https://orcid.org/0009-0002-4162-2773

INTRODUCTION

This work is based on the assumption of the theorization of a decolonial genealogy of knowledge/powers. This project has been developed in the last 2 years, supervised by Prof. Dr. Lucas Trindade da Silva (UFRN), having yielded a research report, published in the annals of the XXXIV Congress of Scientific and Technological Initiation of the Federal University of Rio Grande do Norte (UFRN), and an article in the publication phase. To this end, the proposition of a decolonial genealogy takes place through the theoretical-methodological approach of the genealogy of power erected by Michel Foucault, strongly influenced by the thought of Friedrich Nietzsche, and by the critique of the coloniality of power developed by Aníbal Quijano.

The proposition of a decolonial genealogical analysis of Eurocentric knowledge is partly due to the influence suffered by the thought of Santiago Castro-Gómez, especially in *the social sciences, epistemic violence and the problem of the "invention of the other"* (2005), *Decolonizar la universidad. La hybris del punto cero y el diálogo de saberes* (2007a) and *Michel Foucault y la colonialidad del poder* (2007b). Together with the expansion of the concept of Foucaultian device by the hands of the Brazilian philosopher Sueli Carneiro, proposed in *Device of raciality: The invention of the other as not being as the foundation of being* (2023).

Therefore, unlike the works carried out previously, in which the greatest centrality fell on Foucault and Quijano, with these other two thinkers as secondary, who helped to think about decolonial genealogy, in this theoretical production, I will seek to give greater centrality to the thought of Castro-Gómez and Carneiro. It can be said that it will be possible to see both the Foucaultian and decolonial sides of the Colombian thinker and how the concept of raciality device thought by the Brazilian author becomes a key mechanism for thinking about the epistemic dynamics within Latin American materialities.

That said, the broader plane of this theoretical production is engendered by the approximation between Foucaultian genealogy and its origins, in Nietzsche, and Quijano's decolonial thought, thus producing a decolonial genealogy or genealogical decoloniality. This perspective of analysis of the Latin American social conjuncture is based on the assumption of the denial of the hegemonic Eurocentric ideal present in the canon of the humanities in the production of knowledge about Latin America. In addition, understanding the coloniality of power and Eurocentrism as devices of power and truth, respectively, is vital for the advancement of research.

To this end, Foucault (2021b) shows us that disciplinary techniques are mechanisms of differentiation, subjection/subjection, and individualization. Thus, with the expansion of these forms of exercising power, there is the emergence of the human sciences. These sciences remain with great influence from the natural sciences and positivism.

In addition, I intend to develop throughout this research, what I consider to be a new terminology of analysis of the mechanisms of hierarchization, subjection/subjection and individualization: the coloniality of biopolitics. A mechanism for controlling life and death through a logic of superiority on the part of the countries of the Global North, arising from the colonization period.

To this end, this research can be divided into two central axes: on the one hand, how the human and social sciences act within the context of colonialism and coloniality, being mechanisms of paramount importance in the colonization of these third world countries; on the other hand, I will seek to erect what I have been calling the coloniality of biopolitics, getting closer and closer to the decolonial debate of authors such as Santiago Castro-Gómez, Walter Mignolo, Ramón Grosfoguel and Aníbal Quijano himself to think about how this form of control of the subject population occurs. In this way, I will continue the debate that I have been doing in recent years on the proposition of a decolonial genealogical analysis of knowledge/powers, updating it.

The comparative analysis of the genealogy of power and the coloniality of power will start from Foucault and Quijano's refusal to work with the notion of ideology, adopting, respectively: the notions of truth device, that is, the political function of truth discourses, the discursiveness created and employed by them to exercise a certain social function and the mechanisms of power that allow their functioning; and Eurocentrism, or, in other words, the understanding of the production of European rationality as a constituent of the discursive formations present in countries affected by their geopolitical and military domination.

EUROCENTRIC KNOWLEDGE IN THE CONTEXT OF COLONIALITY

The proposition of a differential analysis of the epistemic mechanisms of coloniality necessarily implies the understanding of the role that intellectuals occupy within the context of colonialism and coloniality. Both European authors, Michel Foucault and Gilles Deleuze, and authors from the Global South, Gayatri Spivak and Florestan Fernandes, agree on one thing about the function of intellectuals: they are not necessary in representing the ideas of the people. In an interview in Foucault (2021), he and Deleuze discuss how the masses do not depend on intellectuals to know reality, however, there is a limit to what can and how this concreteness can be known, due to power relations.

For them, intellectuals are representatives of certain forms of exercise of knowledge/power. Because they are considered holders of this knowledge, and, as shown in previous research, see Sena (2023), it is not possible to exercise power without the action of knowledge, they are seen as the representatives of the uneducated masses. To this end, the agency of intellectuals for the cause of the

masses is, yes, a challenge to be carried out, but with the due consideration that they are not and should not be the leaders of the rebel movements.

For Spivak (2010), the use of intellectuals acts in a logic of permanence of exclusion of those who can or cannot speak about themselves. For her, within the colonization context, the more one belongs to marginalized groups, such as women, blacks and non-heteronormative people, the less one has the right to report their struggles and life experiences. Unlike her, Fernandes (2009) understands that the role of intellectuals may or may not be associated with the emancipatory context. To this end, the author presents the concepts of revolution within order and revolution outside order. Revolution within the order would be a type of revolution that does not shake the existing structures in a significant way, and does not seek to make profound changes in the status quo. On the other hand, the revolution outside the order presents itself as a way to break with the current forms of domination that dependent and late capitalism imposes. For him, the role of intellectuals may or may not be in favor of these significant changes in the current structures, and it is of paramount importance that they work, together with the people, so that there is a "deconstruction" of them.

For Castro-Gómez (2005), the social sciences occupied a privileged place in terms of hierarchization between the various societies. For him, many of them emerged as a way of analyzing "less developed" societies. To this end, "the social sciences have never effected an 'epistemological rupture' – in the Althusserian sense – in the face of ideology" (Castro-Gómez, 2005, p. 91). In other words, the social sciences, to use Fernandes' (2009) terms, have always been linked to micro revolutions within the order. Castro-Gómez takes up Althusser (1980) when he compares the social sciences to Ideological Apparatuses, even though apparently, in this case, there is a decentralization of the figure of the State. In Althusserian theory, Ideological State Apparatuses (ISAs) are forms of control and subjection of human subjectivity. They subject (trans)forming individuals into subjects, producing subjectivities.

That said, within the colonial context, there is the formation of subjects subaltern to those created in the context of the European ideological apparatus. Not only that, but the ISAs used in colonized countries are often imported from the colonizers. The Colombian thinker, however, does not limit himself to making a synthesis of the theory of subjection/subjection present in Althusserian thought, but also appropriates the one developed by Foucault. For him, the social sciences, in addition to being "Ideological Apparatuses", act in a double theoretical-methodological-comparative movement, where, within colonized countries, they operate as a form of adjustment and control of dissident subjectivities to the exercises of disciplinary knowledge/power. On the outside of these countries, they act as a form of legitimization of the International Division of Labor in favor of the colonizers (Castro-Gómez, 2005).

For the author, "the production of alterity inward and the production of alterity outwards were part of the same power device. The coloniality of power and the coloniality of knowledge are located in the same genetic matrix." (Castro-Gómez, 2005, p.91). In addition to what has been said, this same device of power, to which the author refers, is about the mechanisms of subjection/subjection developed by the coloniality of power and knowledge as forms of creation of subaltern identities.

For the author, Quijano borrows the Foucaultian concept of disciplinary power and expands it with his concept of coloniality of power. For me, however, what Quijano did was an even bolder project: he develops a problematic of the biopolitical-cellular mechanisms of differentiation, hierarchization and subjection/subjection based on Foucault's theorization about the forms of exercise of knowledge and power, a project that will be better developed in the next topic.

According to Castro-Gómez (2007a), due to the influence suffered by Jean Lyotard's thought, both inside and outside the colonial system, universities are in crisis, and their social role, within the context of coloniality, assumes the function of a device that reproduces the coloniality of being, knowledge and power. For him, universities act as forms of legitimization of social knowledge, in separating the doxa from the episteme, from the knowledge that can be known from the knowledge that should not.

Following this logic, Hur (2021) points out that, in universities, there is often the micropolitical agency of the axiomatics of capital in the figure of professors, due to the fact that there is a kind of implicit competition of who makes the most publications. In this way, professors and the university in general are at the service of the capitalistic logic, because it is using a performance diagram, where there is a mechanism of production of more and more capital.

Because of its role as a legitimizing agent of forms of knowledge, it is understood that all forms of knowledge that escape the logic and axiomatics of capital must be set aside. There is currently, it seems, a very strong debate, within the peripheral university context, an increasing discussion of the mechanisms of oppression developed by the countries of the Global North, whether from a Marxist bias, with a critique of central and late capitalism, or from a decolonial, postcolonial or anti-colonial bias. However, as much as these debates have increased in recent years, there does not seem to have been a significant change in university power structures with regard to the validation of forms of knowledge.

In Brazil, due to the implementation of the ethnic-racial quota system, we see a significant increase in black, quilombola and non-quilombola people, and indigenous people within public universities, compared to before this public policy was implemented, but this has not been guaranteeing that these people have the right to share their traditional forms of worldviews.

For a real realization of the decolonization of the current structures of knowledge/power, Castro-Gómez (2007a) shows us a possible path: the decolonization of knowledge and universities

that produce intellectual inequalities through dialogue between knowledges, or transculturality. For the author, it was possible to have a first epistemic rupture, with the advance of postcolonial, decolonial, decolonial and anti-colonial debates. However, this first rupture took place at the doxa level. Thus, a second epistemic rupture is necessary. This time, at the level of episteme.

To this end, it is necessary to rescue the ancestral ways of knowing. Those linked to the corporeality of these subalternized and racialized individuals. Not only its historical resumption, but also its incorporation into the central debates of the current modern/colonial world, with the character of knowledge as important and scientific as that brought with the advance of the westernization of knowledge.

With this in mind, the Colombian author exposes two central ways of decolonizing the university environment: "favoring transdisciplinarity", through the refusal of the capitalistic logic of exclusion (either one is a or one is b), and replacing it with an inclusive logic that encompasses the multiplicity of human subjectivity, with the use of a logic of (if it is a and b). Secondly, "the favoring of transculturality", with the favoring of knowledge from outside Europe and its Eurocentric-white-modern-colonial pattern.

In addition to Castro-Gómez's thought, two other authors of the decolonial turn are of paramount importance for understanding the processes of epistemic inferiorization centered on the racist procedures of erasure, hierarchization, and subjection/subjection. They are: Peruvian sociologist Aníbal Quijano and Puerto Rican sociologist Ramón Grosfoguel. For Quijano (2005a), European colonization in the Americas was based on two central axes of knowledge: Cartesian dualism and social Darwinism. According to the author, with the division made by Descartes between body and mind, in the mid-1630s, Europeans took on the characteristic of rational beings, relegating the rest of humanity to the corporeal side of the mind-body binomial. Social Darwinism, on the other hand, was important to classify the cultures of different countries, making European cultures closer to the ideal of humanity, and non-Western cultures closer to savagery and barbarism.

With this in mind, Grosfoguel (2016), inspired by Quijan's thought, shows that Descartes had an influence on the colonization process not only with his dualism, but mainly with his famous "I think, therefore I am". For the Puerto Rican author, Descartes made a substitution in his philosophy that transformed the philosophical paradigm into a pre- and post-Descartes. This theoretical turn took place in the exchange of the Christian God for the Cartesian "I". The "I", that figure from which all the investigation must start, from which knowledge derives and from which these forms of knowledge are born.

For Grosfoguel (2016), the Cartesian ego established a way of knowing the world that, erroneously, was not established with the relationships between people and the environment. In other words, Descartes was responsible for creating a new form of philosophical impartiality, which was

and continues to be central in today's universities and in the relationships we establish with the various disciplines of knowledge. For him, any form of knowledge that passes through the sieve of corporeality is necessarily wrong. An example of the traditional knowledge of the non-Westernized world.

To this end, Grosfoguel also appropriates the thought of Enrique Dussel to establish his theory on the Cartesian method and its importance in the current modern/colonial world-system. As this show, Dussel presents his idea that Descartes' "I think, therefore I am" is preceded 150 years by a "conquest, therefore I am". And the claim to universality that Descartes' thought brought really comes close to this universal ideal because of the conquest that Europeans subjected to the rest of the world. Thus, "What connects the 'conquest, therefore I am' (Ego conquiro) with the idolatrous 'I think, therefore I am' (Ego cogito) is the epistemic racism/sexism produced by the 'extermination, therefore I am' (Ego extermination)" (Grosfoguel, 2016, p. 31).

The author gives us three ways to solve the problem of universities with a westernized bias that we currently present due to the process of coloniality of knowledge: first, to recognize that the basis of universities is based on epistemic racism/sexism and provincialism, generated by the disqualification and cultural elimination that occurred in the twentieth century. XVI; secondly, the break with "Western epistemology", where there is a search for decision-making universalisms; finally, the redefinition of the canon of Westernized sciences, which have their formation in five countries (Germany, France, Italy, the United States, and England), in addition to the search for "pluralisms of meanings and concepts" (Grosfoguel, 2016).

These three ways of decolonizing the university, which has its westernized bases not only in Descartes, but mainly in Kant and Humboldt, can be summarized within a concept that the author borrows from Dussel: transmodernity. Unlike the postmodern project, which is based in European countries, the transmodern project focuses on countries in the Global South, which suffer from the sieve of coloniality and colonialism. It is based on the search for ways of life that escape the racist, patriarchal, bourgeois, colonial and modern ideals that Europe and the United States have been applying since the twentieth century. In short, "Transmodernity calls for a plurality of solutions, where 'many decide for many'" (Grosfoguel, 2016, p. 45).

With these decolonial authors already mentioned, another thinker of this turn who is of crucial importance for the analysis developed here is Nelson Maldonado-Torres. Maldonado Torres (2006) explains that the human and social sciences played a fundamental role during the colonization process. For him, while areas of the humanities such as sociology and psychology were concerned with studying the societies of the Global North, it was necessary to create two new sciences to study non-European societies: anthropology and orientalism. In addition, the Puerto Rican author states that, on the one hand, the natural sciences, such as physics, chemistry and biology, were concerned

with studying and intervening directly under nature, on the other hand, it was the duty of the human and social sciences to act under European and colonial materiality.

The author makes a genealogy, à la Foucault, of the invention and transformation of the humanities into areas of knowledge that aimed at the study of so-called modern societies for the study and intervention of coloniality and colonialism. For him, Ethnic Studies is a fundamental factor for a real decolonization of university spaces in the Third World, as they break with the racist view predominant in higher education centers. And it is, for him, precisely this role that the human sciences must play in Latin America. A path of aid in the struggle for decolonization and deconiality.

In addition to the central role that Castro-Gómez gives to the social sciences, Carneiro (2023) uses the concept of epistemicide, developed by the Portuguese author Boaventura de Sousa Santos, as a way of explaining how the mechanisms that the device of raciality operates within the scope of colonial knowledge. For her, Sousa Santos presents epistemicide as the other side of the genocide undertaken in the colonization of the Americas.

> In addition to the annulment and disqualification of the knowledge of subjugated peoples, epistemicide implies a persistent process of production of cultural indigence: by denying access to education, especially quality education; by the production of intellectual inferiority; by the different mechanisms of legitimation of blacks as bearers and producers of knowledge and by the lowering of their cognitive capacity; by material deprivation and/or by the impairment of their self-esteem by the processes of discrimination resulting in the educational process (Carneiro, 2023, pp. 88-89).

In this way, the knowing Non-Being affirms the knowing Being in its ontological and gnosiological dimension. Racialized peoples, constituted as the Other of knowledge, culture, civilization and race, operate as mechanisms for the social elevation of non-racialized peoples. With this exposed, the device of raciality operates following a negative and positive logic, concomitantly, as it denies the existence of some in order to (re)affirm the existence of others.

In addition to the use of Boaventura de Sousa Santos, Carneiro (2023) makes strong use of the theory of the racial contract erected by Charles W. Mills to explain, among other things, how knowledge is affected by ethnic-racial relations. For Mills, there is a reality in fact and a reality created by "white epistemic authority", which arises as a way of maintaining power relations between the white race and racialized peoples. The author calls this way of seeing the disputes around knowledge "inverted epistemology", precisely because it does not match the actual reality.

> The racial contract informed by this inverted epistemology leads to epistemicide, after all, the contract requires the epistemic authority to sanction a series of myths and false representations about non-whites and their political, moral, and cognitive capacities (Carneiro, 2023, pp. 93-94).

Epistemicide is actualized in hegemonic scientific practice when it operates in a search for a reality in fact that breaks the "appearance". Because, in this way, all forms of knowledge that escape

the hegemonic-positivist-white ideal are characterized as underdeveloped and subject not only to oblivion, but also to the effective erasure of these traditional relations of knowledge (Carneiro, 2023).

To this end, Antônio Bispo dos Santos (2023), better known as Nego Bispo, presents us with a solution to these forms of disqualification of traditional knowledge, a process he calls cosmophobia: countercolonization. We must appropriate the terms used by whites, as a way to combat them. To move away from white monotheism and its worship of the capital god, from its forms of subjugation of original identities.

COLONIALITY OF BIOPOLITICS

By the coloniality of biopolitics I refer, initially, to the mechanisms of formation and subjection/subjection of human subjectivity and individuality. A specific form of exercise of knowledge and powers that acts in a logic of differentiation-hierarchization of these subjectivities and subalternized corporeities. Following this logic, I think it is a good idea, initially, to explain what configures, on the one hand, the coloniality of power, and on the other hand, biopolitics.

For Foucault (2012; 2021a), biopolitics is characterized by a politics on population. As a form of exercising power in the mesophysical sphere, that is, a middle ground between the microphysics of power and the macrophysics of power (Castro-Gómez, 2007b). Biopolitics emerged in the middle of the eighteenth century, when there was the passage from sovereign power, or Sovereignty, where kings held the power to make die and let live, by a new form of control of power, where there was no longer the figure of the sovereign, and power over life was transformed into a power to make live and let die. Allied to the processes of racism and colonization, biopolitics was used as a State mechanism to control the human species, through the control of hygiene, fertility and death rates, and social assistance policies.

On the other hand, according to Quijano (2005a), the coloniality of power is defined as a mechanism for the exercise of colonial power by the hands of countries of the Global North over countries of the Global South, through both colonialism and coloniality. In view of this, I have proposed, in previous works, that the concept of coloniality of Quijanian power was influenced by the genealogical analysis of Foucaultian power.

With this exposed, as stated in the previous topic, Castro-Gómez (2005) states that Quijano, with his concept of coloniality of power, appropriates the theory of disciplinary power erected by Foucault as a way of analyzing European material relations, and expands it, thus becoming a mechanism for analyzing Latin American materialities. In this way, the analysis of the coloniality of power in Quijano also borrows the Foucaultian concept of biopolitics. With that said, it can be said

that the concept of coloniality in biopolitics is strongly close to the theory of subjection/subjection that I developed in Quijano's thought earlier.

This comparison proves to be plausible and fruitful to analyze because it allows a new way of understanding how the subjectivities and bodies of the Global South are oppressed daily by the mechanisms of coloniality. Thus, "there is not only one coloniality of power, but there are many and its analysis will depend on the level of generality considered (micro, meso or macro), as well as its specific scope of action" (Castro-Gómez, 2007b, p. 168).

Because biopolitics is inserted at the level of the mesophysics of power, the analysis proposed here of a coloniality of biopolitics must necessarily pass through this form of analysis of concreteness. That said, the heterarchical analysis of the forms of power is important in understanding the mechanisms of the coloniality of power. According to Castro-Gómez (2007b), Foucault undertakes a heterarchical theory of power because he understands the processes linked to the exercises of power as a network of tangled threads, and that the different levels of analysis (micro, meso and macro) have certain independences from each other. Unlike the classical theories of power analysis, where the hierarchy of power relations was taken into account, in Foucault, these connections are understood as dispersed and non-linear.

Therefore, Castro-Gómez (2007b) also shows us that the path to the decolonization of power relations should not be based only on the macrostructural level, as certain Marxist analyses want, but also taking into account the coloniality of power in the micro and mesostructural spheres.

> We must understand that decolonization does not depend on molar revolutions (although it does not exclude them), but that it implies the affection and creative transformation of what Pierre Bourdieu called habitus. I would like to call this type of molecular agency, which implies the creation of a post-colonial and post-capitalist habitus, the decoloniality of Being [...] (Castro-Gómez, 2007b, pp. 171-172).

Evidently, one cannot deal with coloniality or biopolitics without dealing with the guiding point of the colonial/modern-biopolitical project: racism. Unlike the version theorized by Foucault, who understands the mechanisms of racism used only by the state apparatus and, mostly, in the Jewish and Nazi questions, the racial theory developed by decolonial authors, using mainly Quijano, is extremely denser and more usable for this work. "Race will be both the organizer of the coloniality of power and the category that will organize the possibility of existence, production, and legitimacy of thought" (Oliveira and Osman, 2023, p. 167).

According to Quijano (2005a), the concept of race dates back to the mid-sixteenth century, with the European invasion of the Americas. The colonizers needed a form of affirmation of themselves and denial of the other that could provide the colonial project. To this end, there was the creation of the concept of race, along with all the evils subsequent to racialized populations. Carneiro (2023) states that, within the context of racial conflicts, the affirmation of the white ideal depends on

the denial of the racialized Other. Therefore, it was necessary to implement what the author calls the raciality device as a way of controlling subjectivities subordinated by the racial criterion.

Having exposed this, I make my own the words of Oliveira and Osman (2023):

> Although it is evident that biopower is not the same as coloniality, it seems reasonable to us to intend to approximate both historical processes as ways of knowing modernity/coloniality, taking into account the premise that power relations as inscribed arise in approximate epochs and have important inflection points in relation to the effects they cause in the world as we know it (Oliveira and Osman, 2023, p. 178).

For Mignolo (2017), coloniality is to the American context what biopolitics is to the European context. According to the author, "'Biopolitics' is a concept of the analytical account of postmodernity. Like its European counterpart, 'coloniality' has been at the center of international debates; in his case, in the non-European world and in the 'former Western Europe'" (Mignolo, 2017, p. 14).

In his article *The structure of knowledge in Westernized universities: epistemic racism/sexism and the four genocides/epistemicides of the long sixteenth century,* Grosfoguel (2016) states that there was a fundamental paradigmatic change in the form of discrimination against Jews and Muslims different from that erected by Foucault in his course *In Defense of Society.* According to the sociologist, before the century. There were several persecutions against these religious populations, however, with the invasion of America in 1492 and the subsequent "invention" of racism against the indigenous people, who came to be considered soulless beings, there was a change in the way Jews and Muslims were seen, converted or not.

According to Grosfoguel (2016), Foucault starts from a place of Eurocentrism when he states that state racism against the Jewish population began in the twentieth century. Thus, for him, "contrary to what Foucault claims, sixteenth-century racism was already institutionalized as biopolitical racism of the State" (Grosfoguel, 2016, p. 41). This way of thinking by the Puerto Rican author is extremely important for the continuation of this research topic, as it inaugurates a new way of understanding the biopolitical mechanisms of the State and updates Foucault's theory on racism.

According to Foucault (2021a), biopower was indispensable for the development of capitalism. However, for the author, this "era of biopower" only really came to be consolidated in the middle of the twentieth century. Based on the assumption made by authors of the decolonial turn, especially here Quijano (1991; 2005b; 2014b) and Mignolo (2017), capitalism emerged together with coloniality and modernity. Also starting from Grosfoguel's (2016) previously mentioned notion of biopolitics, it can be said that it ceased to be analyzed as a triad and began to be seen as a quadriad: capitalism, modernity, coloniality, and biopolitics.

In other words, biopolitical mechanisms were as fundamental as the coloniality of power and knowledge for the emergence of capitalism as a hegemonic monetary system and for the subsequent

invention of modernity as a category of modernization of the social ideal. Therefore, I imagine, the coloniality of biopolitics can be understood as the fourth form of coloniality, together with the coloniality of power, knowledge and being (Castro-Gómez, 2007b).

In the wake of Grosfoguel (2008), we currently live under the sieve of a mechanism called by the author as "global coloniality". Global coloniality is directly intertwined with the modern/colonial capitalist world-system as an extension of the coloniality of power at the global level. This claim to universality may be due to colonization processes and the influence that the countries of the Global North still exert in the Global South. This influence is not only at the cultural level, but mainly at the economic level, due to institutions such as the International Monetary Fund (IMF), and military, through organizations such as the North Atlantic Treaty Organization (NATO) (Grosfoguel, 2008).

The concept developed by Grosfoguel (2008) helps to understand how a coloniality of biopolitics can occur by allowing us to understand how the coloniality of power outside the individual territory of each nation-state is founded and how it works within the context of the modern/colonial capitalist world-system. In addition, it becomes important because it allows the expansion of the thought developed by Quijano, especially in *Coloniality of Power, Eurocentrism and Latin America*, his most influential text for the construction of this text.

Concomitantly with what was previously discussed, the coloniality of biopolitics was established even before what Foucault (2021a) calls the era of biopower. This is due to the fact that the racist mechanisms of the State have been gestated earlier than the author imagined. State racism did not begin with the discrimination suffered by the Jewish population in the twentieth century. XIX, he began with the mechanisms of differentiation, hierarchization and subjection/subjection of Latin American indigenous peoples based on the argument that they were peoples without souls, as Grosfoguel (2016) shows.

Grosfoguel's (2016) argument is based on the idea that, during the Spanish (re)conquest of Al-Andalus, the Jewish and Muslim peoples who chose to remain in that territory were forced by the inquisitorial authorities to convert to Catholic Christianity. In this (re)conquest, Jews and Muslims who had recently converted to Christianity received a different status in relation to Catholics of origin, but without the racial criterion being applied. There was, in fact, the argument of blood purity during the process of the Spanish invasion, but this criterion took into account only the religious criterion.

With the Spanish invasion of the Americas and the subsequent encounter with indigenous peoples, a new criterion for classifying those people was adopted. If, before, Jewish and Muslim converts still enjoyed the privilege of being seen as soul-holders, indigenous peoples were not so lucky initially. The soul, as Grosfoguel (2016) shows, at that time was related to having or not having a religion, and Jews and Muslims had their gods, even if they were considered wrong gods. Unlike

what was considered of the native peoples, who were taxed as having no soul because they did not have gods. The truth is that they did have their gods, but they were totally outside the Western-ocentric-monotheistic-anthropocentric pattern. The indigenous deities were based on the forces and expressions of nature.

That said, the original peoples of the Americas were, according to the Puerto Rican author and in my view, the first to suffer from state and non-state mechanisms of racism. Following this operational logic, the coloniality of biopolitics emerged together with the coloniality of power. In other words, it was necessary to have a form of power that disciplined the subalternized bodies so that they could be at the service of central capitalism, which is the coloniality of power. It was also necessary to create a mechanism for the control and subjugation of non-white and European peoples as seen as sub-species of the human species.

The coloniality of biopolitics, therefore, also depended heavily on the coloniality of knowledge (Eurocentrism) to install itself as a form of subjection/subjection of dissident subjectivities. This correlation occurred because Eurocentrism, which is based on the argument that only knowledge produced along the lines of white-Eurocentric science based on Descartes and Kant, was valid. Thus, it was necessary for Eurocentrism to act as a form of subjection of colonized knowledge and as a method of analysis of the various Latin American materialities.

Also contrary to what was theorized by Foucault, the coloniality of biopolitics is not only exercised at the mesophysical level, but also at the macrophysical and microphysical levels. This phenomenon occurs mainly because it is taking into account that the coloniality of biopolitics goes beyond the state sovereignty of European nation-states and is established as a mechanism of control beyond the Atlantic. With this exposed, the microphysical-cellular criterion of the coloniality of biopolitics is due to its kinship with the coloniality of power as a molecular mechanism of differentiation and analysis of populations subjected to these forms of control of subjectivity and subalternized bodies.

CONCLUSION

The current work plan was based on an archaeogenealogical analysis of the mechanisms of subjection and production of truth under and in the body of individuals who have their cultures, ethnicities, languages and customs subjugated by a brutal process of physical repression, with several deaths and people in a situation of slavery, and mental, due to the devaluation of the significant nexuses present in their lives.

Thus, in order to make the present work possible, a wide range of primary and secondary bibliography related to Michel Foucault, Aníbal Quijano, Santiago Castro-Gómez and Sueli Carneiro was consulted, as well as authors belonging or not to the canon of Social Theory and philosophy, to

understand the possible points of influence that these thinkers exerted on the French philosopher and the Peruvian sociologist.

Having exposed this, it was essential for a better understanding of the subjects studied here, that both the topic of Eurocentric/racist knowledge in the context of coloniality and the concept of coloniality of biopolitics served as a way of updating the broader project that I have been doing in the last two years, entitled decolonial genealogy or genealogical decoloniality. This update takes place, here, because it is unraveling some of the various spheres that coloniality and colonialism infiltrate, requiring a differentiated approach to the analysis of the forms of exercise of knowledge/power at the level of mental and physical colonization.

It was possible to understand how the mechanisms related to Eurocentric knowledge acted in maintaining the status quo of coloniality and colonialism. In this way, the production of Eurocentric knowledge necessarily passes through the sieve of racism, as Grosfoguel (2016) shows. In addition, it was possible to understand the role of intellectuals and universities within the colonization context in the perpetuation of the colonial situation.

It is worth noting that the efforts undertaken here are the continuation of research carried out previously and that will continue to be carried out after the publication of this work. The considerations presented here are still the beginning of a broader project that involves both decolonial genealogy or genealogical decoloniality and the coloniality of biopolitics. This, by the way, still deserves to be explored better in a future text.

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Perception of organizational support, knowledge management and intention to turnover in workers in the city of Natal – RN

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Jefferson Vitoriano Sena[1], Nilton Soares Formiga[2], Fabiana P. Santiago[3], Adelmaria C. Sena[4] and Eduardo Sinedino de Oliveira[5]

ABSTRACT

The professional-organizational environment has revealed for organizational management a close relationship between structure and economic functionality, advantage in competitiveness associated with financial incentives and work function, as well as the influence of motivational and punitive variables on workers when tasks are not fulfilled. The phenomenon of turnover in organizations is not something new, as it is linked to the restructuring and dissolution of traditional organizational functional policies, such as job security, positions, and salaries. On the one hand, the way organizations generate and support their employees would probably be able to reduce the pace of turnover and make the policy of retaining professional talent more consistent; on the other hand, the efficient management of information processes, standards and knowledge related to the quality of the organizational system would be able to provide workers with both a more effective management of knowledge, as well as less intention to leave the organization or request a transfer of sector. These conditions would contribute to a better performance in the work environment and interpersonal relationships with a view to productivity and organizational efficiency. In this case, this study aims to verify the influence of organizational support on knowledge management and these on the intention of turnover in workers of public and private organizations in the city of Natal-RN.

Keywords: Organizational Support, Intention to turnover, Public and private organizations.

[1] Potiguar University/
Federal Institute of Rio Grande do Norte
[2] Potiguar University/
Ânima Ecosystem, Natal, Brazil
[3] Potiguar University/
Ânima Ecosystems, Natal, RN- Brazil
[4] Potiguar University
Ânima Ecosystems, Natal, RN/
Federal Institute of Rio Grande do Norte
[5] Potiguar University/
Ânima Ecosystems, Natal, RN- Brazil

INTRODUCTION

According to Verstegen (2011), throughout the nineteenth century and throughout the twenty-first century, the professional-organizational environment has exerted a marked influence on organizational management, establishing a close relationship between structure and economic functionality. This focus focuses on the search for competitive advantage, associated with financial and labor incentives, as well as the influence of motivational or punitive variables on workers when tasks are not fulfilled.

During this period, efficient management was seen as crucial, highlighting the importance of hierarchical actions, planning, organization, coordination, control, etc. These practices were considered fundamental for socially desirable organizational development and exemplary production, associated with leadership strategies (Andrade, Amboni, 2011; Fayol, 2016). However, as contemporary demands have become more heterogeneous, analogous management strategies have become limited, requiring a reformulation and reinvention of practices in the workplace (Braia, Curral, Gomes, 2014).

In the second half of the twenty-first century, there is a need not only to understand the subjective conditions of "being professional", but also to go far beyond the unidirectional view of the economic perspective aimed at investing in organizational structure and functionality. Organizational management becomes more interested in the processes of human interaction in the relationship between organization, worker and salary, in relation to professional performance and productivity (Tamayo, Paschoal, 2003; Scorsolini-Comin, Inocente, Miura, 2012; Formiga, Fleury, Souza, 2017).

As a result, contemporary organizations seek in the *performance* of employees something far beyond the mechanistic and dualistic execution of work tasks. The emphasis is on competencies and skills that transcend the physical and bureaucratic boundaries of the organization. For this, an assertive performance is necessary, capable of influencing the construction, motivation and fulfillment of organizational objectives (Randeree, Al Youha, 2009; Kuo, 2011; Almatrooshi, Singh, Farouk, 2016).

The phenomenon of turnover in organizations is not recent, dating back to the late 80s, when the world of work and organizations underwent a restructuring and dissolution of traditional organizational functional policies, such as job security, positions and salaries (Ferreira, Freire, 2001; Siqueira, 2014).

However, the analysis of turnover is not limited to changes in the macro, micro or meso-organizational system. The structural and functional fragility in current labor relations contributes to a shorter bond and a greater possibility of breaking these relationships, regardless of the competence, creativity and innovation of the professional. This condition reflects the idea of "less is more" in

contemporary professionals (Franco, Druck, Seligmann-Silva, 2010; Freire, Formiga, Fernandes, 2019).

With the changes in the dynamics and structure of post-modern society, not only an organizational and professional reform can be observed, but also the emergence of conditions of fragility in human resources. The bonds of adherence to the organization, the commitment and engagement between the company and the worker, and the management processes have become more fluid, inconsistent and multiple (Siqueira, Pereira, 1999; Kurtessis et al., 2017).

According to Siqueira et al. (2014), turnover, also known as turnover, refers to a dynamic flow of people in and out of organizations. According to the conception of Siqueira and Pereira (1999), the emergence of voluntary turnover is frequently observed, characterized by the individual decision of the employee to leave the organization in which he works or to change the function or sector of the organization.

In the contemporary world of work, the rupture of the functional link between worker and organization has become easy and fast; The individual decision of the worker to leave the organization is often related to the non-correspondence to the values and attitudes affirmed in the worker-organization relationship.

Due to the impact that turnover has on companies, several studies have been developed seeking to explain how it occurs and how it can be reduced (Souza, Formiga, 2022; Siqueira, Junior, Oliveira, Filho, 2014; Oliveira, Júnior, Poli, Oliveira-Silva, 2018).

In this context, Schwab (1991; Silva, 2018) established two approaches in the search for predictors of turnover: while one of them focuses on psychological factors, the other maintains that environmental factors play a significant role in this process.

Considering the scope of intellectual capital in the organization, knowledge management corresponds to a systematic effort that the organization undertakes in its internal structure and in its relations with employees to develop, use, retain and measure the knowledge of both (organization and worker), with a view to greater efficiency, competitiveness, innovation and optimization in the provision of services and fulfillment of organizational demands (Loureiro, 2003; Mourão, 2009; Santos, Bispo, Abbad, 2014).

It's a fact! In recent years, market demand has pressured organizations to become increasingly innovative in the selection and retention of their specialized professionals. Companies are looking for alternatives that can boost the development and reformulation of human resource practices. Thus, this process is intrinsically linked to the creativity and willingness of the professionals involved in these practices (Teixeira, Curral, Gomes, 2014).

However, in the organizational environment, it is necessary to consider the factors that stimulate the creation and influence the development of professional practices that, in management,

contribute to a very efficient dynamic for mediation between the worker's interest and what the organization offers for the development of a satisfactory work system capable of enabling the exchange of information. the construction of knowledge and social interactions between the relevant actors of the company, influencing the implementation of successful work practices (Santos, Vasconcelos, Cândido, Caldas, 2013).

Smedley (2016) highlights that information, its structuring and maintenance has been the central point of success in the contemporary organizational world, as data of special relevance, when identified and treated, become influential knowledge in the development of organizational processes. For this information to be considered useful in the management process, it is necessary to identify and share it. In this sense, organizational support, which fosters bonds and values the professional who performs his function in the specialized work sector is considered the main means of survival and a fundamental instrument for the continuity of productive organizational activities (Bhatt, Altinay, 2013; Borda, 2011; Bezerra-de-Sousa *et al*., 2022).

In this context, of the numerous social and technological transformations that have influenced human behavior in the organizational environment and have had a direct impact on the internal dynamics of organizations, knowledge management has required workers to comply with specific criteria and norms related to knowledge about organizational practices and regulations to ensure effective professional skills (Zanelli, Borges-Andrade and Bastos, 2004).

Therefore, it is not enough to simply feel safe and have support from the organization, but it is also necessary to act intelligently, structured both in the knowledge that is offered in the organization, either through the organizational culture or by the demands of the manager, but, no less important, by the assimilated experience, in terms of knowledge, of the professional who performs the function.

Such a situation, in the current scenario, highlights that organizations are experiencing, with no return, the digital and informational era (Kohn, Moraes, 2007), a condition that directs workers to relevant information and data sharing stand out as determining strategies for survival and obtaining competitive advantage (Donate, Guadamillas, 2011; Gonzalez, Melo, 2018). However, the efficient sharing of information depends on attributes aimed at professional skills and the organization-worker relationship, related to the nature of knowledge, intrinsic and extrinsic motivations, opportunities and organizational culture (Alcará, Chiara, Rodrigues, Tomaél, Piedade, 2009).

Reflecting on the worker's motivations implies delving into subjective aspects related to the individual's intrinsic behavior (Antunes, Stefano, Berlato, 2011). The study by Tamayo and Paschoal (2003) indicates that the main difficulty in relation to the process of motivating professionals is related to the search for a balance between the interests of the organization and the interests of the worker.

In view of these conceptions, there is a need to analyze support in organizational relationships, a psychological construct capable of measuring the worker's convictions and perspectives in relation to satisfaction with the forms of recognition and appreciation that the organization demonstrates in relation to professional performance. This aspect is considered an influencing factor in worker motivation (Fleury *et al*., 2017).

In addition, based on the perception and experience of the worker, it becomes possible to observe how the organization-management-worker dynamic can influence work performance, organizational citizenship behaviors, creativity and innovation (Oliveira-Castro, Pilati and Borges-Andrade, 1999). As well as, based on this organizational valuation (i.e., the perception that the company values the employee) in the conception of work, how it could influence the way in which, where and why the worker is stimulated to manage information and keep it enriched in his work system, in the case of this project, how to influence knowledge management.

As Davenport (1994) points out, the development of knowledge information management for the management of information resources is not only highly beneficial, but also guides professionals in the effective supervision of knowledge processes, providing support for strategic decision-making and conferring a competitive advantage over competitors.

It is noteworthy that the strategic level (senior management) of the organization, responsible for monitoring the internal and external environment of the business, faces significant demands, for example: Establishment of information policies applicable to the entire company, covering electronic security issues; Creation and maintenance of information stocks, involving the allocation of financial resources for their training and development; Coordination of information within the company, clarifying information systems and their processes; Promotion of efforts to improve the quality of information, considering the complete informational cycle; Creation of information or research centers to meet the needs of users; Planning of information products and services for the company, such as the production of booklets, bulletins, magazines, books and internal electronic materials for the dissemination of organizational information to sectors/units or to the entire organization; Negotiation of information sharing between departments, involving technical aspects related to the inputs of information flow from one department to another, as well as political aspects pertinent to those who can, should or are authorized to be informed and inform internally.

In view of this scenario, the scarcity of research that establishes connections between the three variables stands out: organizational support, knowledge management, and turnover intention. Thus, the imperative of a deeper understanding of this theme arises, configuring itself as a crucial study for both the academic and professional spheres. The central problem that permeates the research is highlighted in the next section, referring to the objectives.

METHODOLOGY

This research will be methodologically structured based on the following approach:

NATURE OF THE RESEARCH

Considering the nature of this investigation, which is aligned with the quantitative perspective, the typology adopted is descriptive and correlational. In this sense, it aims to measure and evaluate specific dimensions, facts and phenomena in a given reality. As for the methodological procedures, the chosen option includes field data survey, with the objective of examining a representative sample of the population and obtaining a direct understanding of the reality based on statistical analyses, as recommended by Creswell (2010) and Sampieri, Collado, Lucio (2013; Alves-Mazzotti, Gewandsznajder, 2004). In this context, the present project aims to conduct a research involving professionals from organizations, both public and private, in the city of Natal, RN.

DESCRIPTION OF THE SAMPLE AND RESEARCH SUBJECTS

The survey was conducted electronically through Google Forms, individually directed to professionals currently working in the labor market in the city of Natal, RN, in public and private organizations. Those interested in participating will be led to access the electronic form, distributed through social networks and/or previously registered emails. It is worth mentioning that participation is completely voluntary and anonymous.

The sample collected was evaluated using the G Power 3.2 statistical package, intended to evaluate the statistical power, determine the necessary sample size and perform specific calculations for the study (Faul, Erdfelder, Lang, Buchner, 2007). For this, the statistical standard of analysis will be considered, with a probability of 95% ($p < 0.05$), a magnitude of the sampling effect ($r \geq 0.50$) and a hypothetical power pattern ($\pi \geq 0.80$). A minimum sample of 150 workers from public and private organizations in the city of Natal-RN presented statistical indicators ($t \geq 1.98$, $\pi \geq 0.92$, p-value ≤ 0.01) that ensured the quality of the sample for research.

As for the ethical criteria of the research, information about the purpose of the research will be provided, along with clear instructions on the questions presented in the instruments. The practices will follow the guidelines of Resolution 466/2012 of the National Health Council for research involving human beings. Participation will be requested through the virtual signing of the Informed Consent Form (ICF).

a. Participants were informed that their responses will be personal and not influenced by the survey administrator. There would be no right or wrong answers, and the answers would be treated according to the participant's interpretation when answering the questions presented, thus ensuring the anonymity of the answers. A researcher with previous experience was available to answer questions and an average time of five minutes was enough to complete the activity.

RESEARCH INSTRUMENT

The research participants answered a questionnaire with the following instruments:

Knowledge Management Scale – developed by Pais (2014), is a measure that encompasses various organizational practices and guidelines related to knowledge management processes, which is composed of 22 items, answered on a five-point Likert scale with a variation of extremes 'almost one applies = 1 to 5 = applies almost totally, distributed in four distinct factors: Cultural Orientation for Knowledge, which indicates the organization's propensity for established practices, rules, norms and procedures that must be followed. It highlights a common framework and a collective memory, emphasizing a shared set of recognized values; Competitive Orientation refers to the organization's inclination to the outside, inserting itself in the context of competitiveness and comparative performance, enabling the strategic management of knowledge, adaptation to the external environment and the achievement of competitive advantages; Formal Knowledge Management Practices encompasses organizational efforts designed around formally instituted processes, especially in the realm of explicit knowledge. It comprises a set of practices aimed at the creation and acquisition of knowledge, aiming to preserve, share and use knowledge in products and services. These practices provide change, organizational development, initiative taking, and innovation; and finally, the Informal Practices of Knowledge Management, refers to the interactions that occur in the organization and facilitate the social construction of knowledge, which emerge in discursive practices and in the creation of a common and collective language. The emphasis on tacit knowledge stands out, which arises from direct and face-to-face contact between individuals. Here, a symbolic management of knowledge occurs, allowing the attribution of meaning.

Organizational Support Perception Scale (EPSO) – This is a scale composed of 9 items, originally developed by Eisenberger *et al.* (1986) and later adapted and validated for the Brazilian context by Siqueira (1995). The objective of this measure is to assess the perception of workers in public and/or private organizations in relation to the company's concern with the well-being of employees. In the measurement of the construct, participants are asked to mark their answer on a seven-point scale, ranging from 1 (strongly disagree) to 7 (strongly agree). Regarding the reliability of the scale, the initial study by Siqueira (1995) revealed an alpha coefficient of 0.86, indicating

internal consistency in the construct measurement. In addition, in a sample of Brazilian workers, Formiga, Fleury and Souza (2014) conducted a survey to verify the consistency of the scale's factor structure, using confirmatory factor analysis. These authors observed favorable psychometric indicators that confirmed the factorial structure proposed by the EPSO author, with values such as: $x^2/gl = 1.42$, RMR = 0.02, GFI = 0.99, AGFI = 0.97, CFI = 0.99, TLI = 0.99 and RMSEA = 0.03.

Turnover Intention Scale (EIR) – This scale was developed by Siqueira et al. (1997) and consists of three items, such as "Do you think about leaving the organization where you work," "Do you plan to leave the organization where you work," and "Do you want to leave the organization where you work." Participants are asked to indicate on a five-point Likert scale, ranging from 1 (never) to 5 (always), how much they agree or disagree with the information expressed in the items. The choice to use this measure stems both from its reliability, with a precision index above 0.70 (α = 0.95), and from being a concise instrument that provides a clear and applicable definition to evaluate the phenomenon addressed in this project.

Sociodemographic Questionnaire: It consisted of obtaining information about the participants, related to the respondent's professional relationship, gender, age, professional qualification, length of service.

DATA ANALYSIS

For data analysis, the statistical software SPSSWIN was used, version 25.0 and in this, initially, the presence of multivariate *outliers* will be verified , which will be carried out through the Kolmogorov-Smirnov (KS) normality test, intended for the analysis of samples greater than 100 subjects. Also, the common variance of the method was evaluated, following the suggestion of Podsakoff, MacKenzie, Lee and Podsakoff (2003), based on the test of a Harman factor to examine the existence of any common bias of the method (CMV) in the collected data.

In SPSS 25.0, descriptive statistics, internal consistency analysis, correlational and variance analysis were performed respectively, mean and standard deviation, Cronbach's alpha, Pearson's correlation, Student's t-test and ANOVA (Dancey, Reidy, 2006).

Specifically, in the evaluation of the mean and standard deviation, a measure of dispersion is sought to examine the regularity of the data in the sample collected. This approach allows identifying whether the data follows a normal distribution and provides insights into the variation in participants' responses to the scales presented (Dancey, Reidy, 2006).

Cronbach's alpha aims to validate the reliability of the instrument for the specific context in which the research was developed. In general, it is expected that the psychometric coefficient observed will be close to 1 (Formiga, 2003).

Pearson's correlation, in turn, examines the product-moment relationship between two or more quantitative variables, measuring the degree of linear correlation between them. The values of r = 1 indicate a perfect positive correlation, r = -1 represents a perfect negative correlation (i.e., when one variable increases, the other always decreases), and r = 0 suggests that the two variables do not linearly depend on each other (Bisquerra, Sarriera, Martinez, 2004).

Student's t-test is used to compare two variables, aiming to verify the mean scores in different groups with the purpose of testing hypotheses between them (Alves, 2017, cited in Bisquerra, Sarriera, Martinez, 2004).

Finally, analysis of variance is used to evaluate the comparison of means at various levels of one or more treatments, using normality-based distributions in construct analyses (Dancey, Reidy, 2006).

RESULTS

In this section, the results of the sociodemographic characterization of the participants, the descriptive analysis of the items, the internal consistency of the measures used, the correlation between the variables and the mean scores of the constructs between the constructs will be presented, referring to the perception of organizational support, knowledge management and intention to turnover in the work environment

The final sample of the study was composed of 212 workers in different work areas in the State of Rio Grande do Norte; Regarding age, it ranged from 20 to 66 years (Mean = 39.31 years, p.d. = 10.21), 55% of the sample was women, 62% had an economic income above 8,000.00 reais, 71% had more than ten years of service, 66% worked day in and day out and 77% were satisfied in the work environment.

Based on these sociodemographic characteristics, multicollinearity was verified, which was evaluated through the correlations between the variables and which was guided by the parameters defined by Tabachnick and Fidell (2001), which established a relationship < 0.90]; Thus, the analysis observed the existence of a correlational variation between the variables lower than the indicator proposed by the authors, ranging from 0.28 to 0.67. This condition indicates that there was no high degree of correlation, which can generate models with low errors.

Regarding the multivariate outliers, these were evaluated using the Kolmogorov-Smirnov (KS) normality test, being intended for samples greater than 100 subjects, and indicators were observed that suggest a sample normality (KS = 1.82; p < 0.47).

Once the normality of the sample was assessed, the normality of the items of the scales was evaluated; for this, discriminative analyses (Mean and SD) and indicators of normality of the items (Skewness – SK and Kurtosis – Ku) of the scales were performed; in Table 1, it is highlighted that

for all items, the means and standard deviations were within the expected range in the distribution of the answers; the standard deviations of the items ranged from 0.86 to 1.98, Sk, from -1.49 to 0.53, and Ku, from -1.24 to 1.49.

With the normality of the sample and the distribution of the items identified and because there are studies in Brazil on the topics developed, however, in a separate way, different from the one intended in this dissertation (cf. on knowledge management - Pais, 2014, Almeida, Formiga, Junior, Souza, 2020 and Araújo, Formiga, 2023; Veloso, 2023; on the perception of organizational support - Sianqueira, 1995; Formiga, Fleury, Souza, 2014 and Franco *et al*., 2021; Intention to rotate - Siqueira *et al*. 1997; Formiga *et al*., 2021; Formiga, Santos, Nascimento, 2022 and Neto, Santana, 2022) these studies prove the factorial organization of the scales used in their respective dimensions.

Thus, an analysis of the internal consistency of these scales was carried out and based on the findings presented by the aforementioned authors, especially with regard to the quantity of the factors of each measure and their psychometric quality, it was observed that the alpha indicators were above 0.70. For both *Cronbach's alpha* and ICC, statistical indicators are used to assess the quality of the measurement scales in their consistency or internal validity of the instrument.

For this, a minimum (0.70) to a maximum (1.00) value is required in order to verify the homogeneity of the items that measure the construct, characterizing a safety for the measurement of the evaluated phenomenon (Pasquali, 2011; Formiga, Pereira, Estevam, 2020). Based on this statistical analysis, psychometric indicators were not only consistent, but also significant, both in the general evaluation of the constructs, which can be affirmed that it was able to measure the theoretical and empirical proposal of the variables, and in the specific dimensions of the knowledge management construct (namely: PRAINFGEST = Informal management practice, PRAFORMGEST = Formal management practice, ORINTCOMP = Competitive orientation, ORINCULCONH = Cultural orientation to knowledge), all above 0.70.

The research participants and their responses in the scales, according to what was theoretically and empirically addressed in the study, were close to those observed by the aforementioned authors (cf. Pasquali, Gouveia, Andriola, Miranda, Ramos, 1994; Formiga, Viseu, Jesus, 2014; Formiga *et al*, 2018; Formiga *et al*., 2019; Formiga, Pereira, Estevam, 2020). Thus, the scales administered for the evaluation of each construct were consistent in their application and quality in a sample of professionals collected in the Brazilian states.

With the measures used being confirmed, which lead to their administration for a sample of workers and confidence in the evaluation of the constructs; In this section of results, the main objective of the study was met (to verify the relationship between positive psychological capital, spirituality at work and general health in workers).

For this, Pearson's correlation calculation was performed between the variables, and the results can be observed in Table 1: the perception of organizational support (SOrg) was positively and significantly related to knowledge management (CGtotal), with both variables, with negative correlational scores with the intention to turnover (RI) (respectively, r = 0.54, r = -0.31 and r = -0.41).

Also noteworthy is the relationship between the perception of organizational support (SOrg) and knowledge management (GCtotal) associated with the specificities of RI (thinking about leaving, planning to leave and wanting to leave) all with negative scores (ranging from -0.27 to -0.41). Another important piece of information is to highlight the positive relationship between the RI items, i.e., thinking, planning and the desire to leave, were related, with variations from 0.72 to 0.86.

Table 3: Correlational scores between organizational support, knowledge management, and turnover intention.

Variables	Average (p.p.)	Organizational Support	Knowledge management	Intention to churn	IR 1	IR 2	IR3
Organizational Support	36,64 (7,99)	---					
Knowledge management	80,19 (14,86)	**0.54***	---				
Intention to churn	7,85 (3,85)	**-0.31***	**-0,43***	---			
IR 1 (You are thinking about leaving the company where you work)	2,67 (1,25)	**-0,31***	-0,41*	0,83*	---		
IR 2 (You plan to leave the company where you work).	2,54 (1,32)	**-0,27***	-0,41**	0,84*	0,86*	---	
IR 3 (You want to leave the company where you work).	2,62 (1,31)	**-0,27***	-0,36*	0,88*	0,72*	0,72*	---

Notes: * p < 0.001.

A detail of KM is that this construct is divided into four dimensions (as a souvenir; PRAINFGEST = Informal Management Practice, PRAFORMGEST = Formal Management Practice, ORINTCOMP = Competitive Orientation, ORINCULCONH = Cultural Orientation for Knowledge), having to relate to SOrg and IR.

In this sense, table 2 shows that the SOrg was positively related to all the dimensions of the GS - Informal Practice, Formal Practice, Competitive Orientation and Cultural Orientation - and these, in turn, were also negatively correlated with Intention and turnover. In the table in question, it was decided to highlight these results in bold.

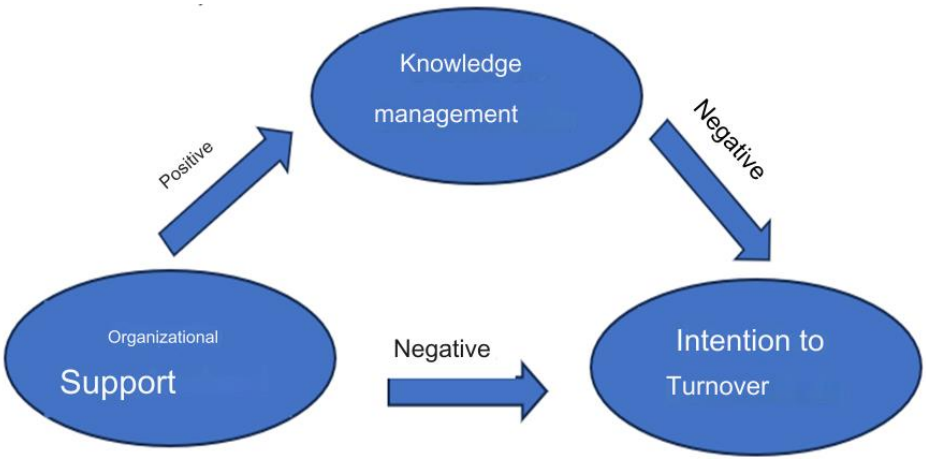
Table 4: Correlational scores between organizational support, dimensions of knowledge management, and turnover intention.

Variables	Organizational Support	PRAINFGEST	PRAFORMGEST	ORINTCOMP	ORINCULCONH	Intention to churn
Organizational Support	---					
PRAINFGEST	**0,32***	---				
PRAFORMGEST	**0,55***	0,62*	---			
ORINTCOMP	**0,45***	0,62*	0,75*	---		
ORINCULCONH	**0,32***	0,25*	0,39*	0,36*	---	
Intention to churn	**-0,31***	**-0,20***	**-0,44***	**-0,43***	**-0,24***	---

Notes: * p < 0.001. PRAINFGEST = Informal Management Practice, PRAFORMGEST = Formal Management Practice, ORINTCOMP = Competitive Orientation, ORINCULCONH = Cultural Orientation for Knowledge.

Seeking a better reading of the correlations between the variables presented in Table 4, which, with the main constructs addressed, revealed correlational scores > 0.30; This condition denotes a conceptual and empirical similarity of the construct with its dimensions and that allows us to affirm that they measured in the expected theoretical-empirical direction. It was decided to present a graphic representation that meets the central objective of this dissertation. In figure 1, it is possible to observe both the direction and strength of the correlations between the variables, which corroborated the hypothesis proposed in the research.

Figure 1: Graphical representation of the correlations of organizational support, knowledge management, and turnover intention in workers



Once the established hypothesis was proven, which, expressed in Figure 1, it was decided to perform a statistical comparison analysis; through ANOVA, associated with the *post-hoc Scheffe*

test, the differences in the mean scores in the dependent versus independent variables were evaluated (see Table 3).

The results revealed the existence of mean scores in the direct effects on the high level of organizational support and high level of knowledge management, as well as on the SOrg *versus* CG interaction effect , which were all significant due to the intention to turnover.

Table 3**:** Differences between the means in the constructs as a function of intention and turnover.

Construct	**Levels**	**Average**	**D.P.**	**Statistics**		
				F Friedman	**Gl**	**p-value**
Organizational Support	Low	2,50	0,11	2,43	2	0,05
	Moderate	2,22	0,11			
	High	**2,50**	0,59			
Knowledge Management	Baixo	2,00	0,27	2,06	2	0,05
	Moderate	**2,12**	0,28			
	High	2,64	0,16			
Organizational support *versus* Knowledge management	Low	2,52	0,13	2,60	3	0,05
	Moderate	2,13	0,16			
	High	**3,00**	0,81			

In general, it is highlighted that the main objective is to verify the influence between three variables: perception of organizational support, knowledge management and intention to turnover in workers of public and private organizations in the city of Natal-RN. In general terms, the research developed is inserted around psychological science applied to the evaluation and implementation of organizational policies for people management and functional quality in the work environment. Condition for which, it is stated that this objective was fulfilled and corroborated as the main hypothesis.

About the specific objectives, taking as a guideline for analysis, the discriminative statistics and internal consistency of the scales, it is highlighted that the psychometric indicators were reliable in the organizational context evaluated. It is noteworthy that in all measures both reliability and reproducibility were feasible and adequate, corresponding to the conceptual and empirical criteria for the evaluation of each construct proposed by the authors who developed the studies with these scales (cf. on knowledge management - Pais, 2014, Almeida; Formiga, Junior; Souza, 2020 and Araújo; Formiga, 2023; Veloso, 2023; on the perception of organizational support - Siqueira, 1995; Ant; Fleury; Souza, 2014 and Franco et al., 2021; Intention to rotate - Siqueira *et al*. 1997; Silva, 2016; Formiga *et al*., 2021; Ant; Saints; Nascimento, 2022 and Neto; Santana, 2022).

In the conceptual evaluation of the indicators evaluated, it is possible to suggest that, for the measures-constructs applied to the quantitative research in this dissertation, the results revealed a

confidence in the confirmation of the hypothesis, reinforcing the conceptual and evaluative direction of the phenomenon verified in the study.

With regard to the correlational model, positive and meaningful relationships were expected; and because there are few studies on the subject in Brazilian production, there was a great expectation in the results. This condition is due to the belief that, in the labor system, when the worker perceives that the organization offers him links and support for a productive and healthy development (it is understood as organizational support), the management would not only be competent; Able to manage more applied knowledge and with a content of efficiency for the administration of the function and quality of the service, consecutively, a low interest in leaving the job or work function, creating organizational value.

Thus, when observing figure 1, which is presented as a general representation of the main results, it is possible to affirm the interdependent relationship between the variables, highlighting a system of organizational conduct stabbed in the human resource, because, when there is good organizational support, there would also be good management and better commitment of the employee, inhibiting interest (think, volition and planning) to leave the organization or work sector.

From these findings, it is considered that the central objective, which, confirmed, highlights that the theoretical proposal can be applied, based on the perspective of the cognitive approach applied to organizational and work psychology. Regarding the administration of the scales for the evaluation of the work process and the dynamics of the human resource in the work environment. A fact to be considered is that labor is not a phenomenon that would occur in a labor vacuum, especially when it is intended to develop and maintain functional qualification and productivity in the organizational system.

In this context, the role of organizational support is of great importance, as it would not only meet the organization's norms and the implementation of a more humane organizational policy, as well as the condition of an identity process of the worker-organization dyad and vice versa, as it would contribute to the formation and development of an evaluative perception of the professional regarding the bond established by the organization with him, being able to lead to work with well-being and satisfaction with the work environment in their work space (cf. Formiga et al., 2015; Formiga, Franco, Nascimento, 2022).

In this sense, it is necessary not only to make it clear that the beliefs, values, and attitudes that emerge in the organizational culture, as proposed by Formiga and Souza (2019), that this construct is capable of influencing the way in which people-workers can behave and relate in their work environment, because, from this culture, the information about the appropriate and legitimate conducts expressed symbolically or concretely in the behaviors of leaders, in organizational policies

and human resource management practices, etc., would be able to integrate new and old employees, with a view to better administration and organizational productivity.

An issue that draws attention is not only regarding the condition of organizational support that is related to all dimensions of knowledge management, a situation that is quite comprehensive, because, by establishing a good bond and appreciation with the employee, it is quite possible that the worker assimilates the manager's ways of managing in the face of the numerous management conditions highlighted by Paes (2014) (namely: Informal Management Practice, Formal Management Practice, Competitive Orientation and Cultural Orientation for Knowledge), thus promoting a dynamic of knowledge (tacit or not) capable of managing desirable practices to remain in the sector and/or in the organization itself, leading the worker to an efficient function and with a good interpersonal relationship.

In general terms, by highlighting the need for greater interaction between organizational support-knowledge management-turnover intention, it is believed in the contribution to a better presentation of organizational normative criteria, but also to a possible adherence to institutional management policies for productivity and functional quality; this issue has already been highlighted by Formiga, Franco and Nascimento (2022), because, for these authors, the greater the organizational support, the lower the intention of turnover. What the results present as a condition of value and importance of the phenomenon is regarding the perspective of management being a mediating variable; Leaving the sector or organization in which one works would no longer be a material issue, but a human one, especially on how to manage.

Within this context, it is feasible to consider the idea of creating and applying an organizational education that empowers both employees and managers. Through training, continuous development and employee support programs, focused on transformation opportunities, it seeks to value, recognize and empower each individual, investing in their growth not only professionally, but also personally. The goal is to go beyond the simple condition of being a professional, aspiring to be a fully developed person.

The fact is that, when considering the concept proposed by Paes (2014) on knowledge management, which attributes to this construct a set of daily activities related to the creation and development of internal organizational conditions that catalyze all processes related to knowledge, as a resource. Because, based on the results, it is not an exclusive assimilation for the worker's 'self', but so that such knowledge is shared and applied in the best way to maintain the norm and belief in work and organization; Probably, good organizational support will trigger perceptive processes based on knowledge management, for the identification and control of a bad system and devaluation of the employee, consecutively, harming the work system.

This reflection can be understood by observing the high scores in the relationship that the Formal Practice of Management and Competitive Orientation of knowledge management presented both with organizational support and with the intention of turnover, respectively, a positive and negative relationship (cf. Table 4); thus considered, management is based on the normative system of the organization, a condition that would probably have its structure and function based on the organizational culture.

In the studies developed by Formiga, Andrade Junior and Almeida (2022), they observed that an organization, whether public or private, that implements an organizational culture more structured in values and practices, is able to manage knowledge, especially management based on knowledge of cultural orientation and practical form of knowledge, making the work environment more transparent and willing to learn.

Also, Araújo and Formiga (2023), with the adaptation of the concept of knowledge management applied to the phenomenon of digitality and organizational strategies, observed how a work dynamic centered on the highest level of knowledge management was able to lead employees to a greater understanding and digital strategic application and greater agility in solving organizational problems.

FINAL CONSIDERATIONS

Even though these results were significant and corroborate the objectives of this dissertation, it is noted that there is low productivity in the association of the triad of variables presented in this study; Thus, it suggests for future research, the realization of studies with workers from other work systems, as well as contemplating in the socio-professional variables, information about the profession and satisfaction with it, with a view to evaluating the processes of professional satisfaction and the constructs addressed in the dissertation.

Another very useful study is to compare the same variables in different crops and companies that were implemented in rural and urban areas; Also, it would be important to study how to engage in the methodologies of worker-manager self-confrontation in the socio-cognitive organization of culture understanding, organizational support and knowledge management. Finally, another useful study would be to compare these same constructs between companies formed by families and public companies, as well as small, medium and large companies.

In general, it is necessary to highlight that the present dissertation has its academic contribution when it comes to guidance in the professional and cultural training environment that the way people generate knowledge, this, could not be considered an egocentric, individualistic or even fanciful structure, but should occur through the appreciation that the organization offers to its professionals, allowing them to develop satisfactorily.

In relation to professional contribution, it is very important that the HR of organizations or even university-company cooperation can indicate paths that lead to better functional productivity, highlighting that the norm by the norm is not enough, and rather, associated with the perception of organizational support could better develop the way in which the professional will manage his knowledge in the organization's own system, without biases and noise, harming the work dynamics.

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Benefits of Intergenerational Programs for children and adolescents with mental disorders risk factors: An integrative review

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Estella Ramos Rezende[1] and Ana Rosa Airão Barboza[2]

ABSTRACT

Intergenerational programs provide interaction opportunities between younger and older generations in activities that promote both physical and mental well-being for those involved. Proposals investing in these projects in favor of preventive actions for childhood and adolescence mental health have already revealed the potential contribution of these practices for mental care prevention in this period of life. In this sense, the objective of the current study is to identify possible benefits of intergenerational programs for children and adolescents vulnerable to the development of mental disorders, using for this purpose an integrative review of the literature, as it allows the inclusion of experimental and non-experimental studies, combining theoretical data and empirical literature, for an expanded and current understanding of the topic under analysis. By means of searching LILACS, Cochrane, PsycINFO, PubMed and Web of Science databases and using the life cycle approach to risk factors for mental disorders, 283 articles were identified, from which only three were included. The selected studies described intergenerational programs which had positive outcomes for children and adolescents involved, such as increased self-esteem, improved interpersonal relationships, lower stress and greater life satisfaction. Using scientific correlations from well-established research, such outcomes could be interpreted as benefits for the mental health of children and adolescents with mental disorders risk factors. Thus, the review proposes a new point of view to deepen studies in future research on the role that intergenerational programs can play in mental health prevention of pediatric population.

Keywords: Intergenerational relations, Child, Adolescent, Mental health, Mental disorders.

[1] Universidade Federal do Estado do Rio de Janeiro, Brazil
E-mail: estellarezende.med@gmail.com
ORCID: https://orcid.org/0000-0001-6319-6707
[2] Universidade Federal do Estado do Rio de Janeiro, Brazil
E-mail: ana.airão@edu.unirio.br
ORCID: https://orcid.org/0000-0003-1622-2225

INTRODUCTION

Intergenerational programs are a form of social action that provides opportunities for the exchange of resources and learning between younger and older generations, enabling the creation of meaningful relationships and the emotional and social growth of participants by influencing both individual self-esteem and the capacity to fully participate in society (Giraudeau & Bailly, 2019; Kaplan, 2001). This definition is in alignment with the *International Consortium for Intergenerational Programs*, which is an organization founded in 1999 in the Netherlands aiming to place together policymakers, academics and practitioners in order to promote intergenerational practice (Kaplan, 2001).

Based on the perspective that family generational synergy can be reproduced in social models, intergenerational programs often involve older adults supporting or serving young people; young people supporting or serving older adults; older adults and young people collaborating on behalf of the community; or older adults and young people in shared activities. The means of organization varies according to the purpose. Some projects have artistic or leisure activities, such as gardening, music, reading, conversations and games. Others aim for educational purposes, such as developing academic knowledge and skills or promoting positive psychosocial changes in attitudes between generations. There are also health-related programs with the purpose of encouraging physical activities and/or improving the quality of life of participants (Giraudeau & Bailly, 2019).

The most common model of program is characterized by interaction with school-age children (Giraudeau & Bailly, 2019). An example is the *Project Together Old and Young – TOY*, which was developed between 2012 and 2014 in seven European Union countries: Ireland, Italy, Slovenia, Spain, the Netherlands, Poland and Portugal (TOY, 2016). The purpose of the initiative was to promote intergenerational learning among children aged zero to eight and the elderly in spaces such as bookstores, cultural and artistic centers, community gardens and schools. The project led way to the global movement *TOY Program,* with the objective to extend intergenerational learning activities to disadvantaged and segregated communities due to the benefits obtained from the project, such as improved feelings of well-being, reduced loneliness and greater social cohesion (TOY, 2016).

Regarding the benefits of intergenerational programs, it is worth highlighting a review published in 2015 about the effectiveness of the economic aspects of these initiatives in relation to the academic performance and psychosocial outcomes of children and young people (La Park, 2015). The study was conducted by La Park (2015) and covered the period between 1986 and mid-2014, analyzing 11 articles with interventions that took place in the United States of America (USA), Brazil and Canada. These studies were based on Randomized Clinical Trials (RCT), non-randomized and observational trials. La Park (2015) noted psychological and social outcomes for child and youth population: lower anxiety, greater self-esteem, improved communication skills and reduced social

distance in relationships between family and non-family members (La Park, 2015).

Additionally, a research project conducted by the University of New Mexico uncovers a new perspective for intergenerational initiatives regarding child and youth mental health by associating an action targeting local indigenous young people, *Zero Suicide*, with an intergenerational program called KICKS – *Katishtya Intergenerational Culture Knowledge Seminars* (Altschul & Fink, 2019). The goal of this project is to address risk factors related to the high rate of suicide among the local young indigenous American population, through intergenerational cultural teachings that provides opportunity to promote resilience among the young people involved. The reason for this is that resilience constitutes an important component of preventive actions in mental health, since it includes internal and external protective factors, in addition to emotional stability (Altschul & Fink, 2019).

Attempting to understand the data that reflects the current scenario of child and youth mental health, it is possible to highlight in the *Guidelines on mental health promotive and preventive interventions for adolescents: helping adolescents thrive*, published by the World Health Organization (WHO) in 2020, that the main cause of disability in young people is associated with mental disorders, with up to 50% of these problems starting before the age of 14 (WHO, 2020). In addition, the *United Nations International Children's Emergency Fund* (UNICEF), in a 2021 publication entitled *The State of the World's Children 2021; On My Mind: promoting, protecting and caring for children's mental health*, reinforces that mental health conditions and lack of care remain the most significant source of suffering for children and young people (UNICEF, 2021).

In this report, UNICEF (2021) comments that although 90% of the global adolescent population lives in low and middle-income countries, data on child mental health at these regions only covers around 2% of the group, which challenges obtaining accurate global estimative regarding issues associated with mental health, as well as makes the implementation of appropriate policies and programs to protect children and assist adolescents more difficult. This fact is due to the importance of data on prevalence, risk and protective factors for such planning. Nevertheless, UNICEF (2021) unravels some estimates regarding the global prevalence of mental disorders and suicide among adolescents. In 2019, the prevalence of mental disorders was 13,5% for boys and 11,2% for girls aged ten to 14; increasing to 14,1% and 13,9%, respectively, for young people aged 15 to 19. Concerning the issue of suicide, it was identified as the fifth most prevalent cause of death in the group aged ten to 19 and the fourth most prevalent in the group aged 15 to 19 (UNICEF, 2021).

The impact of the most recent scenario from coronavirus COVID-19 pandemic was also covered by UNICEF (2021). It was pointed out that although COVID-19 pandemic led to more discussions around the mental health of a generation of children, the associated repercussions perhaps have represented just the tip of an iceberg for long neglected (UNICEF, 2021). Furthermore,

a systematic review on the impact of the pandemic on children and adolescent mental health revealed that the most observed symptoms during this period included anxiety, depression, loneliness, stress and tension, standing out among these the importance of positive coping strategies with family and social support in order to achieve better outcomes (Theberath et al., 2022).

Considering the outlined setting and recognizing the potential contribution of intergenerational programs to the pediatric population mental health care, as well as the possible impact that its in-depth study may have on prevention strategies for this group, it is possible to note the relevance of grounding the thesis that intergenerational programs can present positive and meaningful outcomes for children and adolescents who exhibit risk factors for mental disorders. For that, it is essential to determine which factors symbolizes risks for the development of mental health problems.

The proposed life cycle approach to risk factors for mental disorders in childhood and adolescence present in Kieling et al. (2011) proves to be useful. The study analyzed the scenario of global evidence on child and youth mental health at the areas of epidemiology, intervention and implementation strategies in low resource contexts, considering the importance of assessing mental health problems and associated risk and protective factors in low and middle-income countries, as they are home to the majority of child and youth population (Kieling et al., 2011; UNICEF, 2021). Moreover, the research pointed out that the life cycle approach provides opportunity to build a model capable of mapping relevant risk factors in a chronological order that begins at the period prior to conception and follow until the next generation (Kieling et al., 2011).

In this model, risks with incidence throughout life are represented at the center and comprehend questions such as: genetics; physical health problems and nutritional status of the child; physical and mental health of caregivers; loss of caregivers or orphanhood; growth within an institution; precariousness of psychosocial and educational environments; exposure to harmful substances and toxins; violence; armed conflicts and wars; forced displacement; immigrant status; natural disasters; gender disparities; severe physical punishment; and abuse or neglect. Surrounding these risks are those specific to each age, typical of each stage of life: the pre-conception period; the pre-natal and perinatal periods; childhood; and school period (Kieling et al., 2011).

Based on the approach portrayed in Kieling et al. (2011), it is possible to more easily identify the intergenerational projects that include among their participants the pediatric population with the risk profile for mental disorders, according to each age group and period of life, in order to highlight the positive effects of these programs that can be interpreted as benefits for the mental health of children and adolescents (Kieling et al., 2011). Therefore, the objective of the current study is to identify possible benefits of intergenerational programs for children and adolescents vulnerable to the development of mental disorders, using for this purpose an integrative review of the literature, as

it allows the inclusion of experimental and non-experimental studies, combining theoretical data and empirical literature, for an expanded and current understanding of the topic under analysis (M. T. De Souza et al., 2010).

METHODOLOGY

An integrative review of the literature was conducted, following the six stages proposed by Botelho et al. (2011). The stages included: elaborating the research question and choosing the databases and descriptors; determining the inclusion and exclusion criteria and searching the databases; building the search strategy flow diagram to detect the pre-selected and selected records; categorizing the selected articles in the synthesis matrix for a methodological data analysis and subsequent interpretation of results; discussing the results; writing the conclusion and final considerations and presenting the work in a scientific paper (Botelho et al., 2011).

As a resource for elaborating the research question, for the definition of inclusion and exclusion criteria and for the analysis of evidence levels from the selected studies, it was used the instrument associated with Evidence-Based Practice (EBP), which is present in the book *Johns Hopkins evidence-based practice for nurses and healthcare professionals: Model and guidelines* (Dang et al., 2022). Access to the electronic *form appendices was requested through the Copyright Permission Form* at the online address of the *Institute for Johns Hopkins Nursing* (IJHN, 2022).

FORMULATION OF THE RESEARCH QUESTION

In the first stage, the research question was elaborated clearly and precisely, based on the defined theme. The Johns Hopkins EBP instrument was used (Dang et al., 2022). This tool proposes to use PICO strategy for developing the question and search terms: P for patient, population or problem; I for intervention; C for comparison; and O for outcomes (Dang et al., 2022). As the current work aims to understand the state of the art of the topic under study, the question outlined is considered in accordance with what the Johns Hopkins tool proposes: a “background question” and, therefore, the non-inclusion of search term C, which would more appropriated for studies with a “foreground question”. Based on that, the question was formulated: “What are the benefits of intergenerational programs for children and adolescents with mental disorders risk factors?”. For search term P, the match was “children and adolescents with mental disorders risk factors”; for I, “intergenerational programs”; and for O, “benefits”.

Once the question was assembled, the descriptors and databases were chosen. Databases included: LILACS, Cochrane, PsycINFO, PubMed and Web of Science. To establish the descriptors, John Hopkins EBP tool suggests its selection from PICO elements (Dang et al., 2022). Thus, the descriptors were initially formed based on element P, which is “children and adolescents with mental

disorders risk factors"; and element I, which is "intergenerational programs". As the risk factors used as parameters in this review come from a specific study, they were included as inclusion criteria and not as descriptors, and therefore are described in the criteria development stage.

Based on the search for PubMed indexed terms beginning with "*intergenerational*", it was possible to identify the following terms applied with truncation operators: *"intergenerational activit*", "intergenerational practice*", "intergenerational project*", "intergenerational initiative*", "intergenerational experience*", "intergenerational intervention*", "intergenerational volunteer*", "intergenerational mentoring"* e *"intergenerational learning"*. It is also worth considering that the Descriptors in Health Sciences/Medical Subject Headings (DeCS/MeSH) related to the term "*intergenerational*" were researched as well, from what the DeCS/MeSH "*intergenerational relations/ethnology*" was selected.

Regarding the descriptors originated from PICO elements "children" and "adolescents", the used DeCS/MeSH terms were "child" and "adolescent". Qualifiers were not used in order to widen search possibilities among the articles that addressed intergenerational projects. Also, for this reason, the choice of terms in addition to the mentioned DeCS/MeSH was considered relating to the possible denominations of the age group of interest in the current review, having the following descriptors been selected: *"infant*", "toddler*", "preschool*", "school*", "child*", "adolescent*", "teen*" e "youth*"*. The targeted age range was under 19 years old (up to 18 years and 11 months) and is better explained in the inclusion criteria stage.

INCLUSION AND EXCLUSION CRITERIA

In the second stage, the inclusion and exclusion criteria were established and the databases search was conducted. The inclusion criteria were: period of publication between 2011 and 2021; language of articles be in English, Spanish or Portuguese; studies that evaluated a specific intergenerational program between a non-family older person and a child and/or adolescent; children and/or adolescents under 19 years old (up to 18 years and 11 months); presence of at least one risk factor for mental disorders in the children and adolescents involved in the programs, considering as risk factors those focused on the life cycle approach portrayed by Kieling et al. (2011); studies that aimed to include the evaluation of the impact of intergenerational programs on children and/or adolescents; studies in which family members, staff, social workers, caregivers, nurses, school or daycare teachers, volunteers or others participated only as facilitators or evaluators/informants of the interaction; studies in which the older person was within the WHO classification for elderly (Machado, 2022); and articles in which at least one of the researchers would be from the healthcare field, considering that this review proposal is to direct the conclusions to the work of mental healthcare professionals specialized in childhood and adolescence.

The age range criterion for young participants was determined based on WHO definitions of children and adolescents. These designations are, respectively: a person under 18 years old (definition adopted by the *Convention on the Rights of the Child*); and a person between ten and 19 years old (WHO, 2024). This reference was adopted in order to universalize the standard of analysis, since the designation of each one of these ages varies according to the legal specifications of each country, fact that also implies differences in the age group considered as pediatric in each location. It is also worth noting that although WHO defines other age groups in addition to those already mentioned, such as "youth", between 15 and 24 years old (WHO, 2024), this concept was not considered in the review. Nonetheless, as it is an alternative term for "adolescent", DeCS/MeSH "youth" was adopted as a descriptor.

Regarding the inclusion criteria, the established ones were: studies in which relationships associated with family were the main focus; themes other than non-family intergenerational relationships within a specific intergenerational program; those that did not specify the young participants age or only provided the mean age value, without the standard deviation; studies whose young participants were over 19 years old; those involving participants in the main interaction other than non-family adults classified as older people and facilitators or evaluators/ informants of the program; those whose objectives were other than the effects on young participants; studies that did not involve the risk factors for the development of mental disorders portrayed in Kieling et al. (2011); those that did not specify results for the group of interest; those that involved older people under 60 years old; studies in which the age groups within the program were divided into different groups; and articles that did not involve any healthcare researcher.

Thus, in general, the following descriptors and Boolean operators were used:

(*"intergenerational program*" OR "intergenerational activit*" OR "intergenerational practice*" OR "intergenerational project*" OR "intergenerational initiative*" OR "intergenerational experience*" OR "intergenerational intervention*" OR "intergenerational volunteer*" OR "intergenerational mentoring" OR "intergenerational learning" OR "intergenerational relations/ethnology"[MeSH]) AND ("child"[MeSH] OR "adolescent"[MeSH] OR infant* OR toddler* OR preschool* OR school* OR child* OR adolescent* OR teen* OR youth*) AND ("older adult*" OR elder* OR senior* OR retired* OR resident* OR aged*) NOT (famil* OR parent* OR mother* OR father* OR maternal* OR paternal* OR filial* OR offspring* OR son OR daughter* OR sibling* OR brother* OR sister* OR relative* OR spouse* OR marriage*) NOT ("intergenerational mobilit*" OR "intergenerational social mobilit*" OR "intergenerational transfer*" OR "transgenerational*"*)

SEARCH STRATEGIES

The third stage consisted of screening the studies by title, abstract and full text, based on the inclusion and exclusion criteria. To organize the screening process, a search strategy flow diagram was created based on PRISMA 2020 (Page et al., 2021). This choice was made due to PRISMA 2020 be the more up to date one. Furthermore, according to *The PRISMA 2020 statement: an updated guideline for reporting systematic reviews*, the referred PRISMA replaces the previous one, from 2009, and the guidance is that the latter should no longer be used (Page et al., 2021). Although PRISMA flow diagram was created for systematic reviews, several integrative reviews have already used of this instrument, adapting it to the search structure. Thus, PRISMA 2020 was adapted for the current study.

SYNTHESIS MATRIX

Subsequently, in the fourth stage, the John Hopkins EBP tool (Dang et al. 2022) was used in order to identify the level of evidence and quality classification of the included studies. Also at this stage, the synthesis matrix was created, which constitutes an important tool for enabling the analysis of each article at a methodological and outcomes level (Botelho et al., 2011). The parameters used for its elaboration were obtained from a broad collection of data on: title; publication periodic; year of publication; database in which the article was found; publication language; country in which the study took place; area of professional activity of the researchers; objective(s) of the study; study design; type of methodological approach; method of data collection and analysis; participants sample and their characteristics (such as quantity, age, sex, health status and inclusion and exclusion criteria of subjects); purpose of the program; place of implementation of the project; quality of activities and interactions (types of activities, number, frequency and length); findings on the children and adolescents participants; and researchers' considerations.

DATA ANALYSIS

In the fifth and penultimate stage, the results from studies were discussed, aiming a better comprehension of how the benefits of intergenerational programs for the pediatric population with the mental disorders risk factors identified in the literature can be interpreted as positive mental health outcomes.

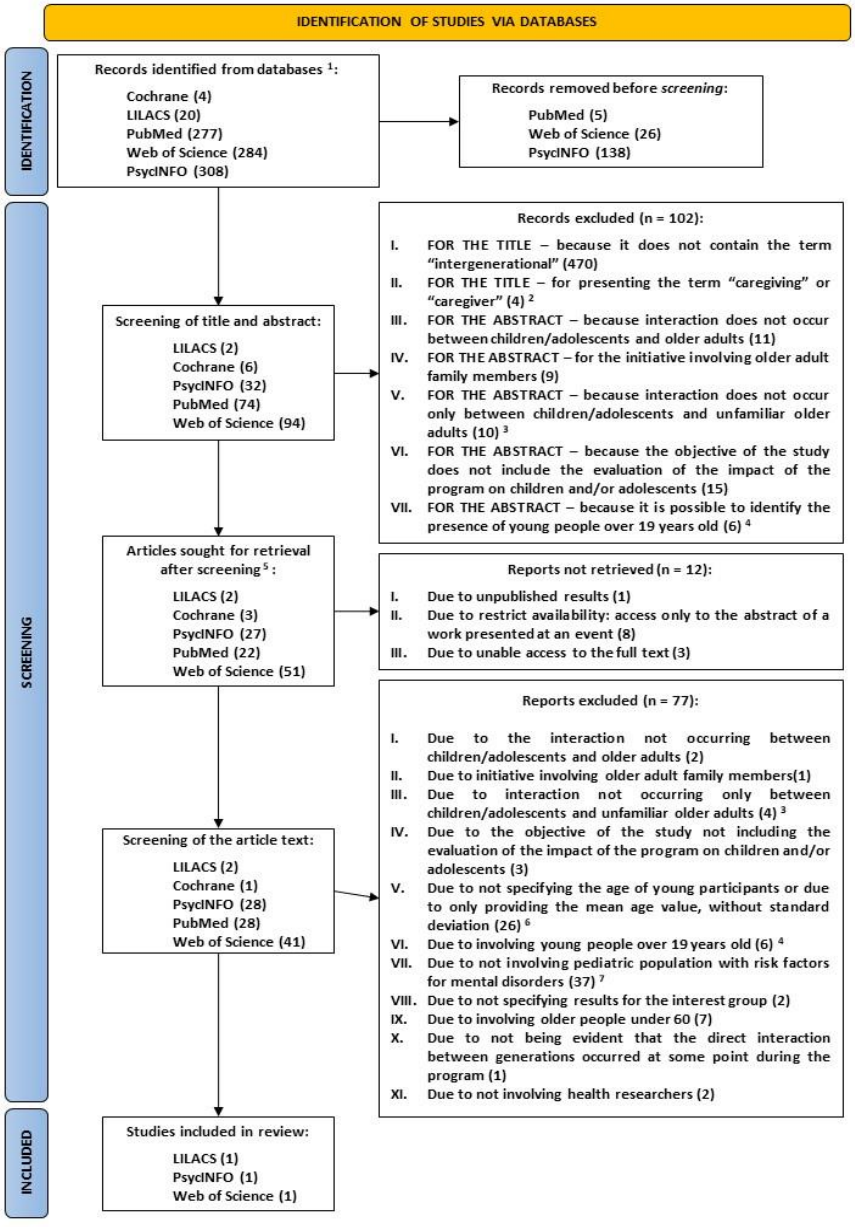
CONCLUSION OF THE REVIEW

Finally, the sixth and final stage consisted of writing the final considerations.

RESULTS

From the search in databases with descriptors, Boolean operators and year and language filters, 283 records were identified. After removing duplicates and screening by title, abstract and full text based on the established inclusion and exclusion criteria, only three studies were considered for analysis of the results, according to the adapted PRISMA 2020 flow diagram portrayed in the following Figure 1.

Figure 1 – Flow diagram of studies selection.



[1]The search was conducted using the Boolean descriptors and operators that best met the inclusion and exclusion criteria.

[2]Studies with themes other than non-family intergenerational relationships within a specific program were excluded.

[3]Studies that involved family members, staff, social workers, caregivers, nurses, school or daycare teachers, volunteers, or others acting as facilitators or evaluators/informants of the interaction were considered suitable for inclusion.

[4] Over 19 years of age, in this review, refers to people over 18 years and 11 months.

[5]"Reports sought for retrieval" is the stage of checking the availability of the full text.

[6]Studies that did not specify or only provided the average age (without standard deviation) were not considered.

[7]Risk factors for mental disorders were based on the life cycle approach portrayed in Kieling et al. (2011).

Source: Adapted from PRISMA (2020).

Despite ten studies had involved children and adolescents under 19 years of age (up to 18 years and 11 months) and presented risk factors for mental disorders development, four of them did not specify the older people age or had, among the older adults, individuals under 60 years of age. Furthermore, among the six remaining articles, only four included at least one healthcare professional and, among these, one separated the age groups into different interaction teams during the program. Finally, only three studies have fully met the eligibility criteria.

Sequentially, Table 1 summarizes some of the parameters used to elaborate the synthesis matrix of the three included articles.

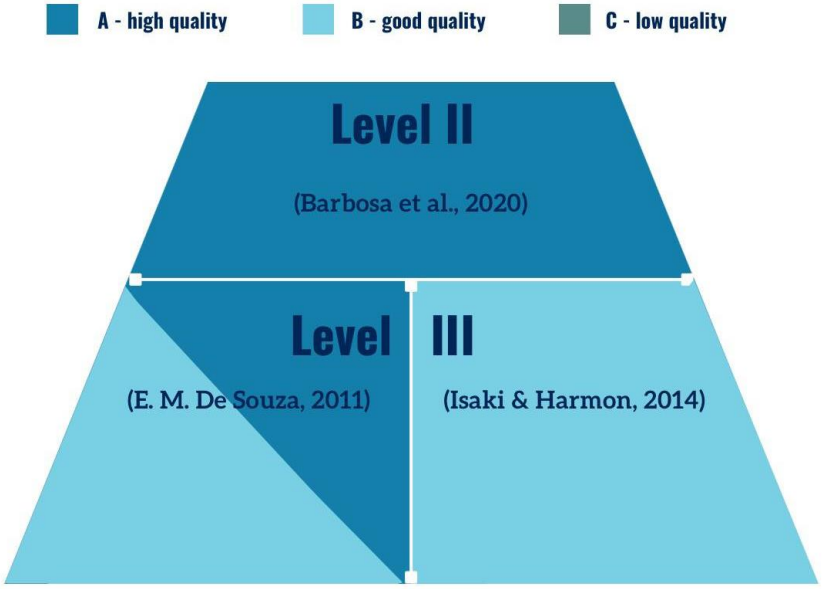
Table 1 – Synthesis matrix summary, with characterization of the study title, year and country of publication, professional category of authors, objective of the intergenerational program, profile of the participants sample and quality of activities and interactions.

Title	Year/ country of publication/ Professional category of authors	Objective of the intergenerational program	Profile of participants sample	Quality of activities and interactions
Intergenerational integration, social capital and health: a theoretical framework and results from a qualitative study	2011 Brazil Medicine	Promote intergenerational interaction between adolescents and elderly people through reminiscence processes (memory activation).	The adolescents involved aged 12 to 18 years old and belonged to five classes from the 7th and 8th grades of high school, with each class having an average of 23 students; the elderly were 32 in total and aged 60 years old or over.	Activities aimed to activate memories and included interviews, photographs and old objects. In each session there were discussions of topics, workshops and joint celebrations. Meetings lasted around two hours, weekly, with an average of 14 sessions, between July and November of 2002.
Children and Adults Reading Interactively: The Social Benefits of an Exploratory Intergenerational Program	2014 EUA Audiology and Speech-Language Pathology	Encourage engagement and support the development of children's language and reading skills through shared reading with older adults and story retellings.	There were 12 children in total, five girls and seven boys, aged eight to 11, and had difficulties in academic performance associated with language and reading. There were six elderly participants in total, institutionalized, between 72 and 88 years old; diagnosed with mild dementia or mild cognitive impairment, but able to read and communicate verbally. A postgraduate student clinician in Speech-language pathology acted as a facilitator of the interaction.	The meetings were within a weekly frequency and occurred in the assisted living facility. The entire project length was eight weeks and each session lasted 45 minutes. Participants were divided into three groups with one elderly person, two children and one postgraduate student clinician in each. Eight narrative storybooks were selected based on themes of interest to school-age children and having an engaging content. Eight images were selected from each book to facilitate temporal sequence in the moments of retelling the stories. To encourage conversation, a weekly artistic activity was also implemented in association with the story or an upcoming holiday.
"Give and Receive": The Impact of an Intergenerational Program on Institutionalized Children and Older Adults	2020 Portugal Psychology	Promote interaction between institutionalized children and elderly by reading an excerpt from the book "*The Little Prince*", by Antoine de Saint-Exupéry.	There were 12 boys, six in the intervention group, six in the control one; between seven and 11 years old in the intervention group and between six and 11 years old in the control. Children unable to participate due to schedule incompatibility remained in control group. The elderly were women; also lived in an institution; ages varied between 75 and 87 in the intervention group and between 72 and 90 in the control one, with six elderly women in each. The conditions for participating were: being institutionalized, having high levels of loneliness and weak social networks.	The program was conducted during the year of 2015, with monthly two-hour meetings. The sessions took place in the elderly women's own institution, as well as in unusual spaces for both participants. There were 12 meetings in total and the highlight of each session was an excerpt from the book "*The Little Prince*". The activities were based on Erikson's Theory of Psychosocial Development and the topics covered included: tame; positivity; emotions; sharing; care giving; gratitude; representations of youth/old age; affections; integrity; happiness; and friendship, which was the farewell integration.

Source: Self-Authored.

Regarding the assessment of evidence level and quality classification for each article using the John Hopkins EBP tool, it was possible to identify the hierarchy outlined in the following Figure 2: level III and classification A/B, of high/good quality, for the study of E. M. De Souza (2011); level III and classification B, of good quality, for the article of Isaki and Harmon (2014); and level II and classification A, of high quality, for the article of Barbosa et al. (2020).

Figure 2 - Schematization of evidence levels and quality classification for each article.



Source: Self-Authored.

THE PROJECT WITH THE ADOLESCENTS FROM CEILÂNDIA

The inclusion of the study conducted by E. M. De Souza (2011) was possible due to the identification of some risk factors for the development of mental disorders in the adolescents involved in the program. The observed risk factors were: “exposure to violence”, “family problems”, “academic difficulties” and “deficiencies in the psychosocial environment”.

The project took place in a high school in the city of Ceilândia, which corresponds to an administrative region of the Federal District, in Brazil. According to the researcher, it was a low-income urban area with conditions that could predispose the local population to low levels of interaction, reflecting a demand for interventions that would promote social cohesion. (E. M. De Souza, 2011).

The program lasted from July to November 2002. The adolescents involved aged 12 to 18 years old and belonged to five classes from the 7th and 8th grades of high school, with each class having an average of 23 students; the elderly were 32 in total and aged 60 years old or over. All participants were randomly selected. Meetings lasted around two hours, weekly, with an average of 14 sessions. Each group had approximately ten adolescents and two elders. Activities aimed to

activate memories and included interviews, photographs and old objects. In each session there were discussions of topics, workshops and joint celebrations (E. M. De Souza, 2011).

The evaluation method used was the focus groups of study one. Carried out at the referred school, the focus groups were 14 in total. Ten were conducted with the adolescents and four with the elderly. The adolescents' group was made up of five girls and five boys, with an average of nine participants in each. The groups addressed the influence of the project on life aspects of participants, such as: health, family relationships, trust in others and norms of reciprocity. Each group had a facilitator and an observer, who was also responsible for transcribing the tape recordings. Therefore, observations were noted and preliminary codes were created, with quotes to illustrate results. As a study validation strategy, E. M. De Souza (2011) used the triangulation method.

Based on the results obtained, five main themes were elaborated: what was the impression of the project; what was the impact on family relationships; what were the effects on health status; what were the cognitive components of social capital; and which people and institutions would the participants recommend the project to. As the group of interest for the current review is the pediatric population, only findings considered as beneficial to this group were highlighted. (E. M. De Souza, 2011).

With regard to the adolescents' impression on the project, the answers were about the perceived opportunities for self-expression and mutual learning, as well as learning about the past and about respect for elders. (E. M. De Souza, 2011).

Concerning the perceived effects on family relationships, adolescents reported a better understanding of their parents and grandparents, valuing them more and accepting their opinions. The adolescents also recognized the insufficient importance they gave to their own lives, starting to feel fortunate after the project for being able to access schools and amenities considered rare in the past (E. M. De Souza, 2011).

On the subject of health status, the adolescents mentioned that the dialogue with the elderly and the resulting reflections made them feel joyful, less shy and less stressed about school, family and financial issues. The changes in terms of better understanding of reality and the psychological strengthening of adolescents were also significant, especially with regard to awareness of personal value (self-worth) (E. M. De Souza, 2011).

Regarding the cognitive components of social capital, E. M. De Souza (2011) noticed few changes on the adolescents' perspective in terms of trusting people outside of family. The researcher highlighted that it was possible to observe the existence of fixed beliefs in this regard, such as distrust in friends when it came to money. For reciprocity names, however, a strengthening was noticed with young people becoming more friendly, especially with parents, grandparents and elderly

people. Regarding reciprocity, mutual respect and understanding were observed. (E. M. De Souza, 2011).

In the matter of recommending the project to other people and institutions, the young participants showed interest in suggesting it to the elderly, believing it could help them feel useful. The adolescents also recommended the program for young people, especially for the development of activities aiming the prevention of delinquency and drug abuse. This is because the adolescents imagined that young offenders, upon hearing the stories of the elderly, would be inspired by their examples, comparing the conditions older people used to live in with their own lives. The recommendation was also oriented to parents, believing these ones would become more understanding and respectful of their children, also learning to express themselves when discussing sensitive issues. Finally, they suggested the implementation of this type of initiative in orphanages, considering the potential of the interaction with elderly in alleviating feelings of abandonment and establishing family ties, an experience that the young participants themselves lived (E. M. De Souza, 2011).

CARI PROGRAM: READING TO DEVELOP

Regarding the study by Isaki and Harmon (2014), contextualized in the USA, the risk factor for mental disorders in childhood and adolescence identified was “academic difficulties”. According to the information collected, the intergenerational program young participants profile was school-age children whose performance did not correspond to the designated grade, in terms of language or reading skills. In this sense, thinking about the challenges in interpersonal relationships of students with language deficits, the researchers developed the CARI project – *Children and Adults Reading Interactively*, with the aim of harnessing the potential of shared reading with story retelling to encourage interaction between two different groups, so that children's language and reading skills could be nourished (Isaki & Harmon, 2014).

The young participants were 12 in total, five girls and seven boys, aged eight to 11 years old. The selection method to include them in the study occurred based on the teachers' opinion regarding the children’s academic performance in terms of language and reading, with no prior formal assessments nor special educational support. Thus, the researchers limited themselves only to the subjective considerations of the participants’ teachers. The difficulties described were: hesitation in communicating or reading; restricted reading fluency skills; aversion to the process of reading aloud; difficulty retelling parts of a story; and challenges related to the ability to answer questions linked to what was read (Isaki & Harmon, 2014).

There were six elderly participants, between 72 and 88 years old, diagnosed with mild dementia or mild cognitive impairment, according to data provided to the researchers. Cognitive

deficits were one of the reasons for including the elderly in the program, and it was also taken into consideration the condition of residency in an assisted living institution with few opportunities for interaction. All the elderly were able to read and communicate verbally, reveal humor in conversations and form non-verbal facial expressions. No inappropriate social behaviors were observed. There were mobility restrictions for this group (Isaki & Harmon, 2014).

The meetings were within a weekly frequency and occurred in the assisted living facility. The entire project length was eight weeks and each session lasted 45 minutes. The participants were divided into three groups, each consisting of an elder, two children and a postgraduate student in Speech-language pathology. This postgraduate student participation was limited to acting as the interaction facilitator, being responsible for discussing new vocabulary, repeating comments and questions asked by the elderly to the children, and formulating questions that would engage all members of the group in answering. In addition, the postgraduate also had the role of reading the book in advance, as soon as the children arrived, in order to reduce any anxiety when reading with the elderly (Isaki & Harmon, 2014).

With regards to the details of the activities developed, eight narrative storybooks were selected based on themes of interest to school-age children and having an engaging content, as well as temporal sequence and high word frequency. The books were below the students' school level, so that interest in reading would be more feasible. Moreover, eight images were selected from each book to facilitate temporal sequence in the moments of retelling the stories. Additionally, a weekly artistic activity associated with reading the story or an upcoming holiday was implemented. The objective of this activity was to stimulate conversation between the child, the elderly and the facilitator. (Isaki & Harmon, 2014).

As for the evaluation method, considering the interest group of the current review, only the process of analyzing the children was highlighted. For this process, a scale on the perception of older people applied using questions selected from Section III of *Children's Views on Aging* (CVoA). Additionally, the five-point *Likert scale* was employed to define changes in children's perception. Teachers' reports on possible changes in children's reading behavior in classroom after the end of the program were also considered. Furthermore, during the project, comments and observations from the children and the elderly were collected (Isaki & Harmon, 2014).

The answers to the questions selected on Section III of CVoA were converted into scores from one to five, with one being “very negative” and five being “very positive”. The aspects described were more positive. In addition, a two-tailed t-test indicated significant findings for CVoA scores before and after the program. Regarding the feedback from teachers, months after the project it was possible to observe that the children became more confident readers. Parents also reported positive

feelings about their children's experience in the program, having noticed a change in hesitation when reading (Isaki & Harmon, 2014).

Some observations highlighted by Isaki and Harmon (2014) included: greater eye-to-eye contact between the children and the elderly; increase in questions asked by children to the elderly over time; children holding the older participants hands during conversations; and hugs at the end of several sessions. According to the researchers, as the program progressed, the children began to feel more comfortable with the elderly, and several positive comments were noted (Isaki & Harmon, 2014).

From the researchers' perspective, the data resulting from the study suggested that the use of intergenerational initiatives for therapeutic purposes with two populations with communication disorders is viable. For the children involved, the interaction provided the opportunity to practice reading and retelling stories in a free environment, with no pressure or judgment, condition that impacted their attitudes towards the elderly with cognitive deficits (Isaki & Harmon, 2014).

Although data were not collected to evaluate the project effect on each child in terms of reading and language performance, clinicians and supervisors noticed an increase in the confidence when reading aloud and retelling stories. Such perception was reinforced by comments from parents and teachers, and the reduction in children's hesitation and aversion to reading experiences was also highlighted (Isaki & Harmon, 2014).

INTERACTING WITH "THE LITTLE PRINCE"

The risk factors for the development of mental disorders in childhood and adolescence observed in Barbosa et al. (2020) were: "family dysfunction", "exposure to neglect", "loss of carers or being orphaned", "being raised in institutions" and "deficiencies in the psychosocial environment".

In the program studied by Barbosa et al. (2020), the youngest participants were children with a family history of: parents with risky behaviors; parents considered unfit to educate their children; or deceased parents. For these reasons, all the children lived in a charity institution located in a city in the north of Portugal. The legal guardian (tutor) of these children was, in this case, a psychologist. The purpose of the tutor's work was to ensure the education and integral development of the assisted child, enabling access to school and medical care, for example (Barbosa et al., 2020).

Thus, the program was conducted with the children from the referred institution, being a total of 12 boys: six in the intervention group; six in the control one. The age range varied from seven to 11 years old in the intervention group and from six to 11 years old in the control group. The control group included children who were unable to participate in the program due to scheduling incompatibility. The interaction was established with a group of elderly women, also in special

conditions regarding their living place, since all of them also lived in an institution in north of Portugal. Ages ranged between 75 and 87 years old in the intervention group and between 72 and 90 years old in the control group, with six elderly women in each one. The conditions for participating were: being institutionalized, having high levels of loneliness and weak social networks (Barbosa et al., 2020).

The program was conducted during the year of 2015, with monthly two-hour meetings. The sessions took place in the elderly women's own institution, as well as in unusual spaces for both participants. There were 12 meetings in total and the highlight of each session was an excerpt from the book "*The Little Prince*", by Antoine de Saint-Exupéry. The book was used in order to nurture the importance of building meaningful bonds between people (Barbosa et al., 2020).

The activities developed were based on Erikson's Theory of Psychosocial Development. The researchers used this theoretical model considering the possibility of evaluating the development throughout the life cycle, so that both childhood and senescence could be analyzed. Activity themes included: tame; positivity; emotions; sharing; care giving; gratitude; representations of youth and old age; affections; integrity; happiness; and friendship, being this last one the integration for the farewell (Barbosa et al., 2020).

The evaluation method employed in the study was a mixed approach – quantitative and qualitative – and sequential one. A pre-test/post-test quasi-experimental design with a non-equivalent control group was used. The select of most similar groups possible was preferred, in order to fairly compare the experimental part with the control one. Thus, the levels of self-esteem, loneliness, depression and happiness in boys and elderly women were measured. Quantitative measures of self-esteem and happiness were estimated from scales applied to both age groups: the *Rosenberg scale* and the *Subjective Happiness Scale*, respectively. Concerning depression and loneliness, these were analyzed separately, with different instruments, adapted to the specificities of each generation: the *Childhood Depression Inventory* and the *Loneliness Scale* (Barbosa et al., 2020).

Findings regarding the children in the first assessment did not indicate significant statistical differences for the considered variables. Regarding the lack of statistical power for some results due to the small sample size, researchers concluded that the groups (control and intervention ones) were similar in the pre-intervention phase. In the last meeting evaluation, the *Mann-Whitney U Test* showed no statistically significant differences between the groups for loneliness, depression, happiness and self-esteem after the intervention. The researchers again justified these outcomes due to the small sample size and the consequent low statistical power of the values, concluding that the measure considered most relevant for analysis was the effect size r. Therefore, the most relevant score was obtained for self-esteem, which showed a large effect size. Given these results, researchers

considered that the short period between assessments may have been insufficient to detect deeper changes (Barbosa et al., 2020).

For the qualitative analysis, in addition to examining the field notes during research, two focus groups were conducted: one among the children and other among the elderly. The groups took place one month after the end of the program, in each of the institutions, lasting around 45 minutes for the children's group. Two semi-structured interviews were also conducted with a psychologist from the children's institution and a social worker from the elderly facility, lasting approximately one hour. Both focus groups and interviews were recorded and transcribed. The procedure used for such evaluation was the content analysis technique, with systematic coding and subsequent comparison of codes/themes for each classification/coder. (Barbosa et al., 2020).

The researchers' aim was to verify the subjective impact of the project on participants, using the following questions: "How would you describe the impact of this program?" and "What were the main difficulties/challenges you experienced?" Regarding the first one, all participants evaluated the initiative positively. Affects were highlighted as important, with more visible affective displays. According to the technicians at the children's institution, one of the most obvious signs for the children was a photo of "my old" in their rooms, showing the emotional bond that was built. Regarding the second question, researchers highlighted that the involvement of institutionalized people represented a challenge in planning and implementing the program (Barbosa et al., 2020).

DISCUSSION

In order to contextualize the current study proposal, some interpretations of the data collected are worth highlighting. In this sense, regarding the countries in which the research was conducted, it is important to state the fact that, despite these countries having medium-high income and high income (World Bank, 2024), some of the projects carried out took place in regions with socioeconomic disadvantage. Considering this, it can be highlighted that the analysis of such contexts from the life cycle approach to risk factors was useful. This is because, although the study by Kieling et al. (2011) focused on the reality of low and middle-income countries, low-resource regions of high-income countries were also regarded. Thus, it is expected that the analysis applied to the studies is at least partially aligned with the reality of children and adolescents at risk in the world, providing an opportunity to understand how intergenerational programs can help in the promotion and prevention of mental health.

Concerning the risk factors for the development of mental disorders in childhood and adolescence, it was possible to observe that the most frequent included: "deficiencies in the psychosocial environment", "family problems" or "family dysfunction" and "academic difficulties". An article on the relationship between psychosocial stressors and the prognosis of major depressive

disorder, by Gilman et al. (2012), the characterization of a psychosocial or environmental problem is noted: a negative event that happened in a person's life; an environmental difficulty or deficiency; stress in interpersonal relationships, whether family or other social relationships; inadequacy of social support or personal resources; or other problem associated with the context in which a person's difficulties developed. These problems may play a role in the genesis or exacerbation of a mental disorder (Gilman et al., 2012).

Another study, by Grazuleviciene et al. (2017), on the impact of psychosocial environment on the emotional and behavioral difficulties of young children, it was observed that the psychosocial environment in early childhood has an influence on health and well-being, and may be significantly relevant in the development of such difficulties in the future. Factors as family socioeconomic status and parental stress can also impact (Grazuleviciene et al., 2017). In this sense, it is possible to understand how family problems and dysfunctions can affect children's mental health.

The family environment, according to the aforementioned study (Grazuleviciene et al., 2017), has a significant role on the development of behavioral difficulties in children. There is some evidence that repercussions of stressful behavior from parents on children's mental health may be associated with biological components through the secretion of stress hormones and genetic sensitivity. Stress and unfavorable environmental exposures can trigger epigenetic changes, resulting in modification of metabolic pathways involved in the etiology of chronic diseases (Grazuleviciene et al., 2017).

Regarding the influence of academic difficulties, an article by Dias and Seabra (2020), entitled *Mental health, cognition and academic performance in the 1st year of elementary education*, when referencing other studies, sheds more light on the relationship between academic difficulties and mental health. Authors mention that the simultaneous occurrence of behavioral problems and learning difficulties seems to be common and, as an example, make a reference to another study that reveals, among a group of children referred for care due to learning difficulties, two thirds had emotional and/or associated behaviors. The authors also emphasize that the occurrence of low academic performance and behavioral problems exposes children to a situation of psychosocial risk, leading to a worse prognosis and greater frequency of comorbidity with psychiatric disorders (Dias & Seabra, 2020).

BENEFITS TO CHILDREN AND ADOLESCENTS' MENTAL HEALTH

It is possible to note that the studies' results included in this review add to previous findings from works that did not aim at the proposal currently outlined.

The study by La Park (2015), for example, already discussed the benefits of intergenerational programs for the mental health of children and adolescents (La Park, 2015). However, it is worth

adding that, observing La Park (2015) analyzes from the perspective of risk factors addressed from the life cycle approach, it is possible to perceive positive mental health outcomes for the pediatric population with risk factors, although these have not been identified in that way. This is because La Park (2015) describes some programs that, under the interpretation of the current review, denote such peculiarities.

One of the projects analyzed by La Park (2015) involved young African-Americans aged 12 to 17 years old with emotional and behavioral problems and presented positive results such as: group cohesion, transmission of interpersonal skills, hope and altruism. Another initiative, also in the USA, had significant repercussions on the level of anxiety of children, who had inadequate social skills and low self-esteem, increasing the risk of academic failure (La Park, 2015).

Therefore, to understand this new perspective, it is important to correlate results of the current review with already proven benefits for children and adolescents' mental health. In this sense, it was possible to find evidence in Psychiatry and Psychology literature, especially in Positive Psychotherapy studies, which supports the feasibility of correlating intergenerational programs' effects on children and adolescents with benefits for the mental health of this population.

In the book entitled *Psicologia Positiva e Psiquiatria Positiva: A Ciência da Felicidade na Prática Clínica* (Machado & Matsumoto, 2020), it is possible to understand the mental health benefits of many findings specified in the current review. This book was organized by professors Leonardo Machado and Lina Matsumoto, respectively from the Federal University of Pernambuco (UFPE) and the Federal University of São Paulo (USP), receiving contributions from several authors. The preface was written by psychiatrist Dilip Jeste, a pioneer in the Positive Psychiatry movement (Machado & Matsumoto, 2020).

In 2015, Dilip Jeste, then president of the *American Psychiatric Association* (APA), published the article *Positive Psychiatry: Its Time Has Come* (Jeste et al., 2015). In this study, the identification of some of the findings of the articles included in the current review among Positive Psychiatry components is notable. Because Positive Psychiatry is a practice applicable to all subspecialties, including those that work with child and youth population, it is possible to consider being relevant the correlation found.

Furthermore, knowing that Positive Psychiatry is a science centered on biopsychosocial studies to understand and promote well-being and health, not only in diagnosed people, but also in those at high risk of developing mental or physical disorders, the recognition of some of the findings of the articles among the components of this area of psychiatry helps to direct the results' discussion towards the perspective of prevention in mental health (Jeste, 2018; Jeste et al., 2015).

In this sense, it is worth highlighting that the components of Positive Psychiatry that address some of the positive effects of highlighted intergenerational programs include positive psychosocial

characteristics and positive mental health outcomes (Jeste et al., 2015).

Positive psychosocial characteristics encompass psychological traits and environmental factors. Psychological traits involve resilience, optimism, personal mastery, coping for self-efficacy, social engagement, spirituality and religiosity, in addition to wisdom, which includes compassion, empathy, altruism, social decision-making, insight, determination, recognition of uncertainty, emotional regulation, tolerance of divergent value systems, openness to new experiences and a sense of humor. Environmental factors consider family dynamics and support, social support and other environmental determinants of health (Jeste et al., 2015).

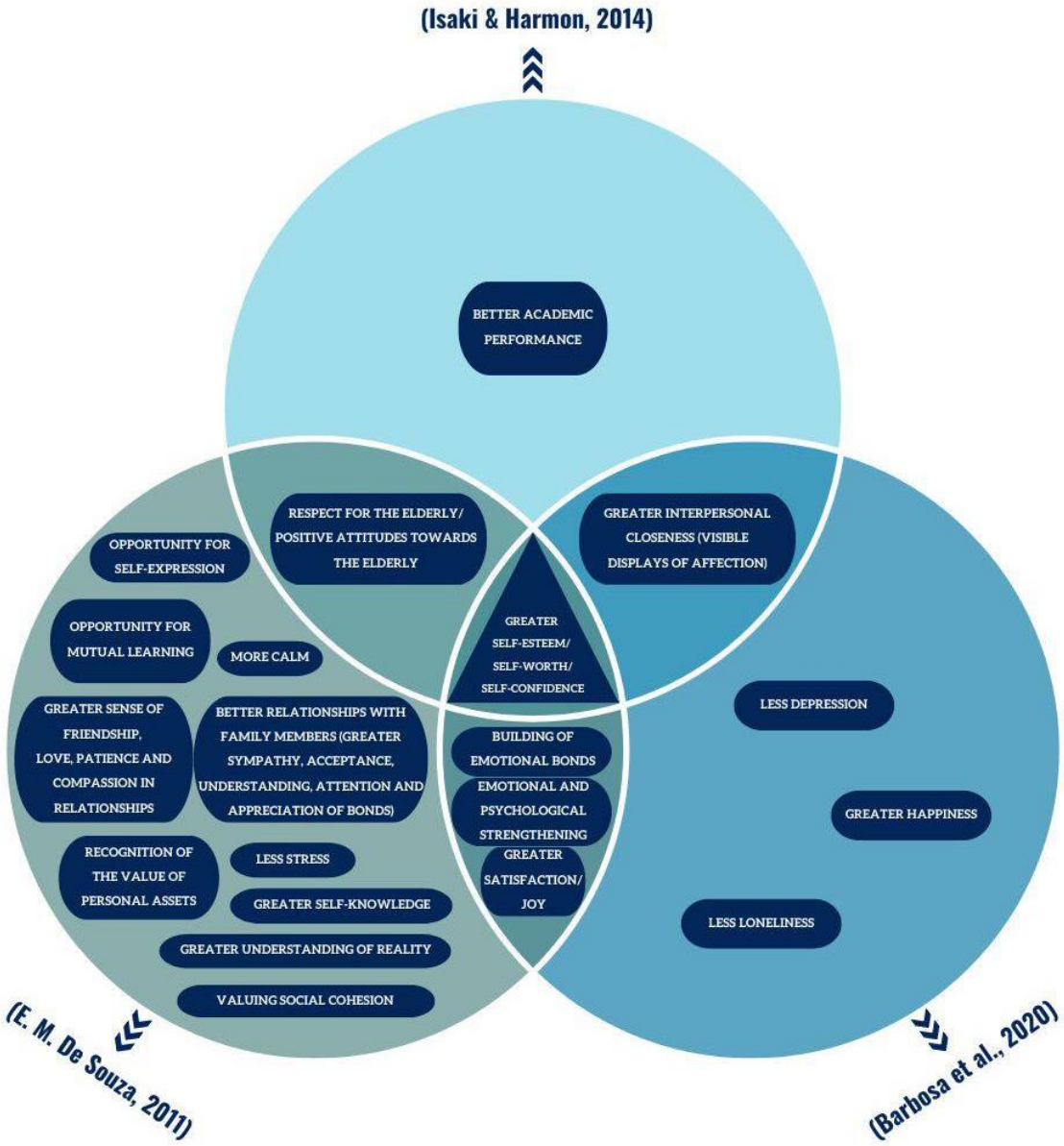
Positive mental health outcomes address notions as: recovery, greater well-being, successful aging and post-traumatic growth. According to Jeste et al. (2015), the concept of recovery is associated with the possibility of coexistence between well-being and illness through an experience of courage, dignity and social contribution. The idea of greater well-being, in turn, is related to human flourishing, which is established through a positive psychological state of life satisfaction and eudaimonic happiness, which encompasses life purpose and self-acceptance. As for successful aging, it is measured by the ability to adapt to circumstances and a positive attitude towards the future (Jeste et al., 2015).

In the analysis to correlate positive mental health outcomes with the studies' findings included in the review, it was possible to identify common points regarding to the constructs of engagement, social contribution, life satisfaction and happiness. Based on this, it becomes possible to infer that such effects can be interpreted as benefits to children and youth mental health.

To better understand how the intergenerational projects' results can be interpreted as positive repercussions on children and adolescents' mental health, a scheme was elaborated with the association of each study outcomes. The scheme portrays both individual findings of each article and those in common, represented in the highlighted intersections.

Figure 3 below illustrates this scheme.

Figure 3 - Benefits of intergenerational programs for children and adolescents' mental health among the findings of each study included in the review.



Source: Self-Authored.

Self-esteem, self-confidence and self-worth

The Ceilândia project recorded greater self-esteem and recognition of adolescents' own value (self-worth) (E. M. De Souza, 2011). The CARI program resulted in greater confidence by conducting reading activities for children with language difficulties (Isaki & Harmon, 2014). And the initiative with institutionalized children also highlighted greater self-esteem (Barbosa et al., 2020).

Nevertheless, in the scientific literature, there are several concepts about self-esteem, since it is a complex construct, as highlighted in one of the chapters of the aforementioned book on Positive Psychology and Psychiatry (Machado & Matsumoto, 2020). Therefore, self-esteem deserves greater consideration in the analysis of its possible contributions to mental health, especially when recognizing its influence on the psychological development of children and adolescents.

Positive Psychology has self-esteem as one of its attributes. In Machado and Matsumoto

(2020), the reference to a study on the role of social support, resilience and self-esteem in protecting against common mental health problems in early adolescence stands out, configuring self-esteem as an indicator of positive mental health capable of promoting self-acceptance, self-responsibility and self-maintenance. The book also mentions other research that highlights the importance of healthy self-esteem as a support for psychological stability and positive social activity, constituting an essential element for the child's psychological development (Machado & Matsumoto, 2020).

Additionally, low self-esteem can be associated with psychological problems, according to Hosogi et al. (2012). In this sense, the research by Henriksen et al. (2017) highlights that clinically assessed adolescents with high self-esteem suffer fewer symptoms of anxiety/depression and attention problems over time. This reinforces the analysis present in Hosogi et al. (2012) that self-esteem acts as a resilience factor for the types of symptoms mentioned.

It is also worth considering that in the aforementioned chapter by Machado and Matsumoto (2020), the author lists some of the positive outcomes associated with high self-esteem that can be identified in literature. These are: greater levels of productivity, psychological well-being and persistence in the face of adversity. We can also highlight, in Hosogi et al. (2012), the mention of WHO document *Preventing suicide: A resource for teachers and other school staff*, which reports the positive influence of self-esteem in protecting mental suffering and discouragement in children and adolescents, enabling them to cope more appropriately challenging and stressful life situations (Hosogi et al., 2012; WHO, 2000).

Interpersonal relationships and psycho-emotional strengthening

Findings from Chen and Harris (2019) on the association of positive family relationships with mental health trajectories from adolescence to middle age suggest that positive family relationships are linked to better mental health outcomes from adolescence. Another article, by Petric (2019), highlights the association between healthy family relationships and the successful development of children. Considering the evidence, it is possible to estimate that the findings of E. M. De Souza (2011) regarding the improvement of family relationships can be configured as benefits to children's mental health. Features of this improvement stand out as greater sympathy, acceptance, understanding, attention and appreciation of family ties, as recorded in the statements of young people from Ceilândia's project (E. M. De Souza, 2011).

Relationships with society in general have also shown benefits to the pediatric population mental health. According to Kingsbury et al. (2019) on the study of protective effect of neighborhood social cohesion on the mental health of adolescents after stressful life events, the greater social cohesion of neighboring population of the adolescents who experienced stressful situations seemed to mitigate the effects of this stress on several domains of their mental health (Kingsbury et al.,

2019). Thus, it is possible to observe that the psycho-emotional strengthening provided by interpersonal relationships also occurs at the community level, and not just within the family.

Considering this, it was possible to find support for the idea that the findings of the articles are beneficial to the pediatric population mental health. Among these findings are: those from E. M. De Souza (2011), regarding the construction of emotional bonds with unfamiliar elderly people and learning about respect for the elderly; those from Barbosa et al. (2020), who also noted this formation of bonds, in addition to visible manifestations of affection; and those from Isaki and Harmon (2014), who obtained positive responses in relation to children's attitudes towards the elderly and realized that children showed greater proximity to older participants, overcoming expectations of difficulties in interaction due to children's language challenges.

It was also noticeable the expansion of the differentiated perspective of interpersonal relationships beyond the elderly in the program. In the case of Ceilândia, this different point of view is due to a community awareness, evident on the adolescents' recommendation of the project to other elderly, young people and family members, arguing that the intergenerational initiative could benefit, for example, youngsters, in terms of preventing risk behaviors (E. M. De Souza, 2011).

Additionally, it is worth highlighting that, among the results of Ceilândia's project, it was meaningful the greater notion of friendship, love, patience and compassion in relationships (E. M. De Souza, 2011). Observing what Positive Psychology depicts about compassion, as stated in Machado and Matsumoto (2020), we can notice how beneficial it is to mental health. In the chapter on compassion and self-compassion, authors state that compassion reduces fear and personal conflicts and increases confidence and inner strength, predisposing to connection between people and producing a feeling of purpose and meaning in life. Authors also distinguish compassion from empathy, commenting that, although compassion emerged from empathy, the meanings are not the same. Empathy is characterized by a type of emotional resonance, while compassion represents the movement to carry out something effective in alleviating other's difficulties, providing energy, a sense of purpose and direction. Thus, authors highlight that individuals who act with compassion benefit both themselves and those around them. (Machado & Matsumoto, 2020).

Self-knowledge

Self-knowledge is a central issue in adolescent development. It can be considered an individual theory that one builds based on one own experience, in order to maximize the psychological well-being, according to Carapeto and Feixas (2020) definitions in a study on how self-knowledge is organized in adolescence. The researchers state that adolescence transformations, as the new contexts and social expectations and the cognitive advances young people experience, put pressure on the implementation of changes in both content and structure of self-knowledge (Carapeto

& Feixas, 2020). Given this, it can be inferred that the positive effect of greater self-knowledge reported by the adolescents in the Ceilândia project (E. M. De Souza, 2011) can be seen as a benefit to the mental health of these young people.

Lower stress, life satisfaction and happiness

The book *Psicologia Positiva e Psiquiatria Positiva: A Ciência da Felicidade na Prática Clínica* also provides a better understanding of how reduced stress, life satisfaction and happiness can benefit mental health. The authors of the chapters that deal with these topics highlight that chronic stress, among other negative emotions, has an influence on the hypothalamic-pituitary-adrenal axis. By stimulating the production of cortisol, inflammatory markers and sympathomimetic stimuli, continuous stress can increase the risk of neoplasms, infections and cardiovascular diseases. However, positive emotions also have the potential to cause biological changes and can help reduce the harmful effects of stress (Machado & Matsumoto, 2020).

Thus, in the context of the repercussions of the studied programs, the report of lower stress, added to the increase in emotions that can contribute to reducing negative consequences of stress, reveals the benefits that intergenerational initiatives can offer to children and adolescents. Reports of emotions that help reduce stress included: more calm, greater joy, greater satisfaction and happiness. In this sense, the benefits occur both in terms of physical health, considering the physical effects of chronic stress mentioned, and mental health, since according to the Centers for Disease Control and Prevention (CDC), chronic physical conditions can increase the risk of mental disorders (CDC, 2024).

Moreover, on the topic of life satisfaction, it is also possible to find references in Machado and Matsumoto (2020) that contribute to the understanding of how the reports of greater satisfaction and greater joy identified by E. M. De Souza (2011) and Barbosa et al. (2020) can represent benefits to the children and adolescents' mental health. In this sense, in the chapter *Satisfação com a vida e qualidade de vida*, the authors mention that the concept of life satisfaction reflects self-appreciation for life (Machado & Matsumoto, 2020).

Still in that chapter, there is a discussion that the construction of the judgment of life satisfaction is intrinsically associated with personal experiences, in order to reflect different moments of life. Therefore, if one is vulnerable at certain periods, one tends to respond in an adaptive way, potentially exposing oneself to risky behaviors that compromise one's health and well-being. However, if one experience social and/or family support, one tends to feel greater confidence in dealing with different situations, placing greater confidence in one's ability to be happy. The author adds that life satisfaction is perpetuated to the extent that one realizes it does not take much to feel happiness (Machado & Matsumoto, 2020). This notion can be highlighted in the young people

speech from Ceilândia's project when they revealed a better recognized of their own lives value through the interaction with the elderly, since these reported to the adolescents the difficulties in the past, such as having access to schools and amenities considered rare (E. M. De Souza, 2011).

The mentioned chapter in Machado and Matsumoto (2020) further clarifies that, because satisfaction with life can be understood as a process to be promoted throughout the life cycle, the probability of having a continuous positive adaptation response throughout the life is longer when the environment, family and community support the development of children and adolescents, providing the necessary resources to overcome adversities. In this sense, the author highlights that, especially since the 1980s, interest in research on the life satisfaction of children and adolescents has been progressive and that a growing number of researchers indicate happiness and life satisfaction as central criteria for health. Thus, it is possible to interpret that the higher levels of happiness recorded in institutionalized children after the program in Barbosa et al. (2020) represented an improvement in mental health.

Finally, it is worth noting that, as described in the chapter on positive emotions and biological aspects of well-being present in Machado and Matsumoto (2020), interest in the study of neural correlations of positive emotions has been increasing in scientific circles. As a pioneer of the theme, a study published in 1995, in the *American Journal of Psychiatry*, aimed to evaluate the results of functional imaging exams of people who, through stimuli, relived transient states of happiness, sadness and neutrality. The results revealed that transient happiness was associated with a diffuse reduction in perfusion in the cortex, especially in the right prefrontal lobe and, bilaterally, in the temporoparietal region (Machado & Matsumoto, 2020). Other studies emerged from this, showing that the formation, control and maintenance of positive emotions are related to reduced activity in the right prefrontal cortex and, bilaterally, in the temporoparietal cortex, in addition to increased activity in the left prefrontal regions (Machado & Matsumoto, 2020).

Thus, it is possible to notice that the positive emotions' benefits, especially happiness, discussed based on the findings of the included articles in the current review, may also be supported by neurobiological foundations, a fact that strengthens the hypothesis of intergenerational programs potential in contributing to children and youth mental health.

FINAL CONSIDERATIONS

Given the contemporary scenario of children and adolescents' mental health, evidenced in its severity by the effects of COVID-19 pandemic (Theberath et al., 2022), it is clear the significance of the implementation of strategies that promote and prevent mental health in childhood and adolescence. Favorable to this purpose, it was possible to identify, through this review, which intergenerational programs report outcomes that can be interpreted as benefits to children and

adolescents' mental health when observing the presence of risk factors for mental disorders, thus enabling further research in future studies on the role that intergenerational initiatives can play in mental health prevention of the pediatric population.

Nevertheless, it is important to recognize the review limitations. For example, the fact that only the perspective of the life cycle approach, by Kieling et al. (2011), was employed for identifying risks in studies was a limiting factor. This is because this article is from 2011 and, since then, new variables may have been evaluated as relevant risk factors for the development of mental disorders in childhood and adolescence. Even so, there was a preference for adopting this approach due to systematic observation of risk factors by Kieling et al. (2011), providing opportunity for a whole perspective, instead of an isolated analysis of age groups.

In this sense, it is also important to consider that the small sample of articles included may have represented a limiting factor to the generalization of conclusions. A likely contributor to the small sample was the fact that many eligibility criteria were used, such as the exclusion of articles that did not include health professionals among the researchers.

Nonetheless, it was possible to see some advantages in the use of different criteria and in the size of the final sample, such as: the articles greater precision in answering the question of the current study; the direction of interpretations and conclusions towards health professionals, especially those who work with children and adolescents' mental health, whether these may be pediatricians, psychiatrists or psychologists; and the possibility of presenting detailed results, both with regard to the methodology adopted and the structure of the analyzed programs.

Even given the limitations outlined, it is possible to share some recommendations for future studies, such as more medical professionals engaging in research on the topic of intergenerational programs. The joint involvement of professionals studying intergenerational projects with specialists in the prevention of children and adolescents' mental health can be a driving measure for the in-depth study of the potential of intergenerational initiatives in contributing to the mental healthcare of children and youth.

It is also worth mentioning that the review's focus of interest was initiatives that engaged youngsters with unfamiliar elderly people and this focus may have provided a more impartial view of the projects' effect on the younger participants, since there may be other variables that influence the benefits observed when the interaction involves members of the same family. These variables may include, for example, the transmission of conflicts through generations. According to studies such as that by Rothenberg et al. (2017; 2018), the effects of this transmission are more intense and harmful. However, this does not diminish the importance of conducting intergenerational programs between individuals from the same family, especially when considering the already proven benefits of multigenerational family therapy (Andolfi, 2016). Therefore, another recommendation of this review

is to invest in future studies with the proposal to evaluate the benefits of projects for children and adolescents interacting with elderly family members.

Hence, it is possible to conclude that, despite the limitations, the review offers a new perspective for future research on the potential of intergenerational programs to contribute to mental health prevention strategies for the pediatric population.

CONFLICTS OF INTEREST

None declared.

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Participatory planning and the new ATER/ATES: An assessment of the challenges of implementation

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Leandro Frederico Ferraz Meyer[1] and Wilza da Silveira Pinto[2]

ABSTRACT

The article submits our reflections on the challenges of participatory planning and collective management of ATER/ATES services in agrarian reform settlements. The Bloomington School's conceptual framework of institutional economics is employed to interpret these challenges as problems of polycentric governance and collective action for the provision of public goods and management of commonly-owned resources. The Habermasian critique of the limits of the conception of instrumental rationality is incorporated into the analysis to broaden the understanding of the different modes of engagement in the dialogical processes of participation. Based on an integrative scheme of the two approaches and results of previous research, the article concludes by stating the impossibility of replacing the internal willingness to cooperate with institutional engineering schemes and external incentives.

Keywords: Agrarian Reform, Peri-urban Settlements, Participatory Planning, Institutional Economics, Bloomington School, Discourse Ethics.

[1] Doctorate. Full Professor. Federal Rural University of the Amazon – UFRA
LATTES: http://lattes.cnpq.br/0022091921157418
[2] Doctorate. Agronomist. Federal Rural University of the Amazon – UFRA
LATTES: http://lattes.cnpq.br/7336335075663142

INTRODUCTION

The use of participatory methods of diagnosis, planning and management of collective actions and solidarity enterprises constitutes, today, the most important methodological reference of the new Technical Assistance and Rural Extension (new ATER) and of the Technical, Social and Environmental Advisory (ATES) services in agrarian reform settlements.

When compared to the "conventional" model of rural extension, adopted in Brazil throughout the 1970s as an instrument for the "modernization of agriculture", the new ATER and INCRA's ATES Program basically invert the previous logic. Instead of putting the "target audiences" at the service of an alien project of modernization and increased productivity, the current methodological orientation proposes to "put the advice at the service of the families' projects" (INCRA, 2010, p. 60).

In the context of agrarian reform, the very choice of the term "advisory" instead of "assistance" seeks to highlight that basic change in attitude and posture that should guide the performance of the new ATER/ATES agents. According to the guidance, agents should act as *facilitators* of genuinely creative processes, aiming at the endogenous construction of local solutions, and no longer as experts of persuasion, focused on the transfer of finished technological solutions, produced externally. Likewise, the inclusion of the expressions "social" and "environmental" in the name of the Program seeks to make explicit the polyvalent, multidimensional character of ATES services, beyond productive issues.

Conceived with excellence and very well articulated on paper, the political and methodological orientation of the new ATER/ATES faces enormous challenges to be put into practice in the field. The interaction of problems ranging from the basic lack of knowledge about the functioning of local agroecosystems, through historical biases in the training of agricultural science professionals, the trends of the dominant social, political, cultural and economic forces, to the multiple limitations of an institutional nature, makes the systematic understanding of the challenges and emerging contradictions an additional difficulty. in the path of actions that aim, on the one hand, to meet the "projects of the families" and, on the other, to overcome predatory forms of use of natural resources and competitive and opportunistic social relations that are often rooted in the knowledge and values of most of the agents involved.

This article aims to contribute to the understanding of the challenges of implementing participatory methods as activities that typify "collective action dilemmas".

The conceptual framework of the Bloomington School (Ostrom 2007; Aligica; Boettle, 2009), of institutional economics, is used to investigate the challenges of community social organization, with a view to the elaboration of Settlement Development Plans (PDAs) for agrarian reform. The typology of actions (social and elementary) and the "ethics of discourse", by Habermas (1990), are integrated into the analytical scheme of the Bloomington School to broaden the discussion of the

potentialities and limitations of dialogue and argumentation, as means of development and support of institutional arrangements.

The usefulness of these theoretical frameworks, for our purposes, is discussed in the context of our experiences of facilitating participatory processes in peri-urban settlements, located in the metropolitan region of Belém, capital of the State of Pará.

THEORETICAL FRAMEWORK

THE CONCEPTUAL FRAMEWORK OF THE BLOOMINGTON SCHOOL

The conceptual framework of the Bloomington School for institutional analysis of the problem of collective action has undergone a series of transformations since the publication of *Governing Commons*, by Elinor Ostrom (1990). Figure 1 shows one of the most recent attempts to portray the complex structure of governance problems in Integrated *Socio Ecological Systems* (*SES*). It represents a response to the challenge of understanding these systems, and seeks to create an adequate language to describe the complex interactions of the institutional, praxeological and normative dimensions in polycentric systems of governance (Aligica; Boettke, 2009, p. 29).

The scheme begins by recognizing that many variables affect interaction patterns and outcomes in these systems, including variables from the overarching socioeconomic and political environment (SOC) and related ecosystems (ECO). The diagram is designed to help *SES* scholars examine the attributes of a given resource system (SREC) and the units of those resources (REC) that affect user incentives (U), within a set of rules created by polycentric systems of governance (SGOV) to affect interactions (INT) and outcomes (RES) over time (E. Ostrom, 2007).

Figure 1 shows only the most abstract level of analysis of a generic SESI. To investigate real problems, in particular SESIs, researchers need to "unwrap" each of the categories shown in the figure, until they reach the level of detail of the variables that is relevant to the question under study. Table 1 presents a first list of "second layer" variables in each category. The variables marked with an asterisk (*) are the ones that most affect the chances of success of self-organization, to create local solutions to collective action problems (Ostrom, 2009).

Based on extensive empirical research, Ostrom et al. suggest that self-organization is facilitated when the SESI is small enough (SREC3) to be monitored (SGOVS8) and so that reliable information (knowledge) about its general condition (U7) can be generated at reasonable costs. The probability of success of self-organization also depends on the productivity of the system (SREC5) and the predictability of its dynamics (SREC7). The productivity of deteriorated systems must allow for viable improvements, in a reasonable time. These conditions are best met when the system has clear boundaries (SREC2) and the resource units remain fixed within them (REC1). The technology available to users (U9), both for the use and recovery of the resource, is also a prominent variable in

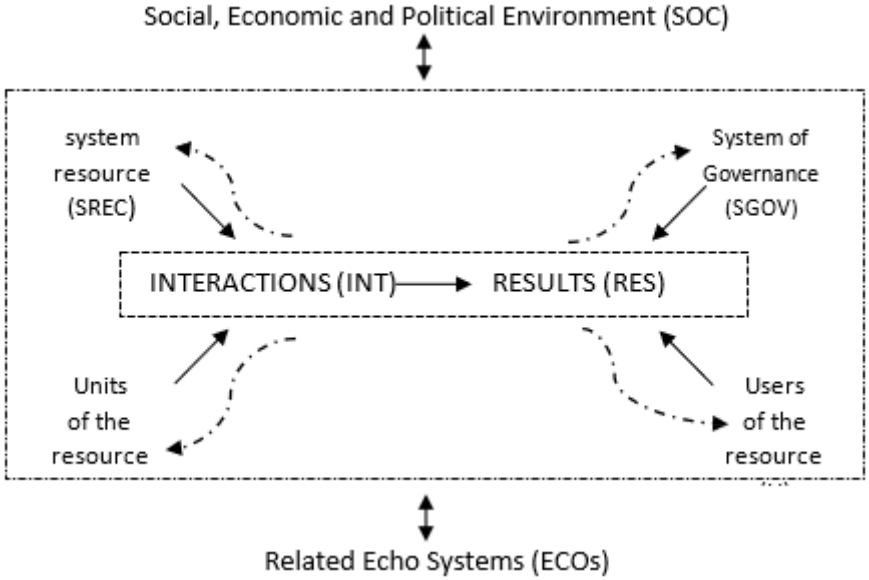
the evaluation of the chances of self-organization. This variable interacts with the socioeconomic attributes of the users (U2). The inequality of these attributes affects access to technology and, consequently, the levels of use of the resource by the various users (INT1).

The economic value of the resource units (REC4) also interacts with the user's attributes to determine a greater or lesser dependency on the resource (U8). According to Ostrom (1999), self-organization is more likely when resources are more important for the well-being of users. The research of the Bloomington School also corroborates the propositions of Olson (1965), for whom self-organization proved to be facilitated when the number of users (U1) is not very large and when there is leadership in the group (U5). In connection with property rights systems and rules of collective choice, informal norms and the quality of "social capital" (Coleman, 1988; Putnam, 2000) also contribute to the social organization of the participants and to the chances of success of collective governance arrangements.

When collective arrangements are being designed, user *participation* (U5) emerges as a fundamental principle that supports the ability of groups to sustain both the provision of the natural resource and the local governance system itself. Ostrom (1999) suggests that most individuals affected by the availability of the resource should participate in the creation and modification of the rules of use (INT3, INT7). In addition, successful collective arrangements usually have monitors (SGOV8) selected by the community, either from among the users themselves or from outside contractors. Since it is rarely possible to suppress all violations of the rules of use (INT4), even in cases where these rules have been collectively agreed, punishment mechanisms (SGOV8) that take into account the seriousness and context of the infraction seem to work better, as an instrument to reinforce the collective arrangement, than inflexible and disproportionate punishment systems. Ostrom (1999) also suggests that successful collective governance systems usually distribute benefits (SGOV4) in proportion to the individual contributions (SGOV6), necessary to enable their creation, monitoring and operationalization.

Finally, since the authority of users to create local rules of appropriation of resources of global interest is limited by broader political systems and rules (SOC4), the rights of self-organization and formulation of their own rules have to be minimally legitimized by official government agencies (SGOV1) (Johnson; Libecap, 1982). Rapid, low-cost access to local arenas for conflict resolution between users, or between users and official agents, is also referred to as an important requirement for the success of social self-organization (Ostrom, 1999).

Figure 1: Conceptual framework for analyzing interactions and outcomes in integrated ecological and social systems (SESIs) (straight arrows indicate direct causal links; curved arrows indicate systemic feedback relationships)



Source: Adapted from Ostrom (2009).

Table 1: "Second layer" variables for analysis of a SESI

SOCIAL, ECONOMIC AND POLITICAL ENVIRONMENT (SOC)	
SOC1- Economic development. SOC2- Demographic trends. SOC3- Political stability. SOC4- Settlement Policy. SOC5- Market incentives. SOC6- Media organizations.	
SYSTEM OF APPEALS (SREC)	**GOVERNANCE SYSTEM (SGOV)**
SREC1 - Sector (water, forest, pastures, fisheries) SREC2 - Clarity of boundary boundaries* SREC3 - Size of the resource system* SREC4 - Existing infrastructure SREC5- System Productivity* SREC6- System Balance Properties SREC7- Predictability of System Dynamics* SREC8- Storage Characteristics SREC9- Location	SGOV1- Governmental organizations SGOV2- Non-governmental organizations SGOV3- Structure of inter-institutional networks SGOV4- Property rights system* SGOV5- Operational rules SGOV6 - Rules of collective choice* SGOV7 - Constitutional rules SGOV8 - Monitoring processes and punishment*
RESOURCE UNITS (REC)	**USERS (U)**
REC1- Resource mobility* REC2- Growth and renewal rates* REC3- Interactions between resource units REC4- Economic value* REC5- Size REC6 - Breakdown of sales REC7 - Special and temporal distribution	U1- Number of users* U2- Socioeconomic attributes of users U3- History of use U4- Location U5- Leadership and entrepreneurship* U6- Norms and "social capital"* U7- Mental models/knowledge of the system* U8- Degree of dependence on the resource* U9- Technology in use*
INTERACTIONS (INT) → RESULTS (RES)	
INT1- Levels of use of the various users* INT2- Information sharing INT3- Decision systems INT4 - User Conflicts* INT5 - Investment Activities INT6 - Lobbying INT7-User self-organization*	RES1- Social performance indicators (e.g., efficiency, equity, accountability) RES2- Ecological performance indicators* (e.g., grazing pressure, resilience, diversity). RES3 - Externalities for other SESIs
RELATED ECOSYSTEMS (ECOS)	
ECO1- Weather patterns ECO2- Pollution patterns. ECO3- Flows in and out of SESI.	

*Subset of variables that most affect the chances of self-organization. Source: Adapted from Ostrom (2007)

The conceptual framework of the Bloomington School provides important guidelines both for "macro" analyses, at the level of the National Plan for Agrarian Reform (II PNRA), for example, and for actions to facilitate social and productive organization, based on participatory methods. More specifically, participation in the effort to draft the Settlement Development Plan (PDA) can be seen as a dilemma of collective action. As a formal piece of environmental licensing, once prepared, the PDA takes on the character of a "public good", where those who have not contributed to the effort of its participatory formulation cannot be prevented from enjoying its benefits.

However, the Bloomington School's view remains constrained by a conception of *instrumental rationality* that biases the analysis of participatory processes, and obscures the role of communication as a means of *rationally justifying* the norms or rules to be agreed upon.

Without delving into the epistemological issues underlying the exclusion of other forms of rationality, except the instrumental one, the next section presents the typology of Habermas' (1984) actions. Next, the perspective of psychological structuralism is employed to integrate this typology into the analytical framework of the Bloomington School.

THE TYPOLOGY OF ACTIONS AND THE ETHICS OF DISCOURSE, BY HABERMAS

As suggested above, the recognition of alternative forms of rationality, beyond the instrumental one, involves a dense epistemological critique. This critique, which gained new impetus with the so-called *linguistic revolution*, is extremely important for the study and interventions in problems of collective action. This is because the instrumental view excludes the possibility of rational justification of actions governed by moral principles or social norms (Habermas, 1984; Heath, 2001). According to this view, it is simply not possible to rationally justify moral principles and social norms. The actions governed by these norms and principles are seen as mere conditionings or habits formed throughout the socialization processes.

This perspective makes it problematic to develop educational practices that have the purpose, precisely, of strengthening the capacity of social organization of communities so that they can create local norms for the governance of common resources and provide collective goods, such as a PDA. In particular, the exclusively instrumental view reduces the practices of communication and dialogue, at the center of participatory processes, to mere instruments of "exchange of information", without being able to exert any restriction on the alternatives of action available to the participants. This limitation becomes even more relevant to the extent that a large part of collective action conflicts have an evident moral component. Since, as the instrumental view preaches, normative arguments cannot be rationally justified, they become merely relative and contingent.

Despite the revolutionary nature of the epistemological change required to re-establish the proper (internal) rationality of moral choices and the following of social norms, *regardless of*

external consequences, "the first thing to note about Habermas's theory of communicative action is that it is a *typological* theory" (Heath, 2001, p. 13, emphasis in original). In other words, by presenting his "discourse ethics" and explaining the rationality of communicative action, Habermas does not reject the instrumental conception of rationality. Heath (ibid) explains that Habermas takes as a starting point that agents have access to a set of different patterns of choice. Communicative action is a type of action governed by a certain pattern, that is: that of producing *understanding*, while instrumental action is another type of action, governed by a different pattern: that of achieving *success* (effectiveness).

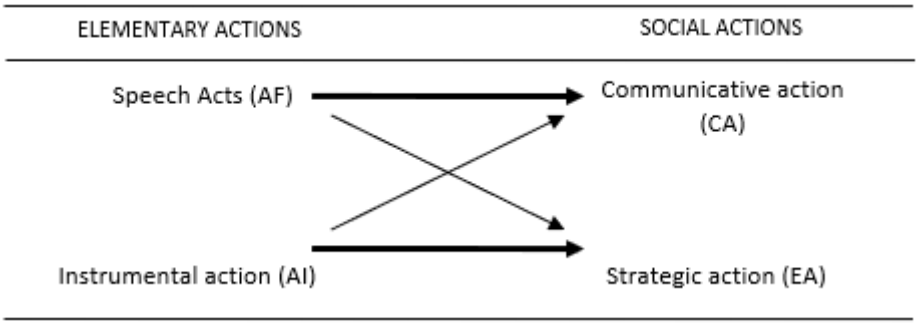
According to Habermas' typology, *instrumental action* and *speech acts* form two types of *elementary actions* (Figure 2). The introduction of a second agent in the scene generates *social action*, understood as a complex phenomenon, involving the interaction of the two elementary forms of action. According to this view, participants in social action always face the problem that their expectations are mutually interdependent. To deal with this interdependence, participants can resort to both *instrumental action* (AI) and speech acts (communication). When actors are primarily interested in the external consequences of action, social action becomes *strategic action* (SA) in the sense used in game theory. However, when communication (FA) is used to coordinate expectations, this generates the form of action that Habermas characterizes as *communicative action* (CA) (Habermas, 1990, p. 133).

This basic scheme is indicated by the horizontal lines in Figure 4. The oblique line, upwards, indicates that CA is not the same as elementary speech acts (AF). Like strategic action (EA), communicative action (CA) also presupposes the basic teleological structure of actions, in which actors are seeking to produce a certain result. In the words of Habermas (1990), the two types of social action differ in the sense that "for the model of strategic action, a structural description of the action directly oriented towards success is sufficient, while the model of action oriented towards producing understanding must specify the propositions of an agreement to be reached communicatively" (p. 134). In other words, when one is engaged in *communicative action*, it is assumed that the actors are "prepared to harmonize their plans of action *by internal means*, committing themselves to pursue their objectives only on the condition of an agreement—existing or to be negotiated—on the definitions of the situation and future results" (ibid, emphasis added). In this way, the honesty of communications is a necessary presupposition of the ethics of discourse and the rationality of communicative action.

Equally, EA is not the same as AI. Like CA, EA also operates in cooperation with speech acts (FA). This is indicated, in Figure 4, by the oblique downward line. The difference is that, in this case, the communication does not imply any restriction on the actions of the participants. In EC, speech only performs the function of exchanging perceptions (or information) about the situation and the

other participants in the action, and can be used, including, but not necessarily, to deceive or deceive others.

Figure 2 – Typology of elementary and social actions.



Source: Adapted from Heath (2001, p. 25)

MENTAL STRUCTURES, COMMUNICATION, AND REVIEW OF PERSPECTIVES IN COLLECTIVE ACTION

As previously pointed out, discourse ethics and the assumptions of rationality of communicative action are important for the processes of social organization, especially when aimed at resolving situations in which rationality or individual gains conflict with rationality or collective gains (the *so-called collective action dilemmas*).

The conflict between individual and collective interests is what highlights the importance of the epistemological discussion about the rationality of moral choices and acts. As Heath (2001) observes, while there are many mysterious things about morality, perhaps the strangest is the fact that what it seems to require us to make choices that run counter to our individual interest. "Morality, therefore," says Heath (ibid, p. 3), "presents itself to us as a duty to refrain from pursuing individual advantage."

Bypassing the epistemological discussion, the theme of moral choices refers us directly to the paradigms of phenomenology and psychological structuralism. According to Wilber (2000), there is a strong convergence of psychological development models, pointing out that people's internal willingness to cooperate with the common good, accepting self-sacrifice and the postponement of gratification, is a capacity that is affirmed late, in the order of subjective development, when the individual reaches higher *stages* of inner growth.

Although it is simple to accept this conclusion in the case of child development, there is great resistance to admitting it to be true in the case of adult development (precisely because of the epistemological difficulties of rational justification of moral acts). In any case, this conclusion is implicit in Habermas' typology of actions (Figure 4) and is made explicit in his analysis of the development of communication capacities and styles. In *Moral Consciousness and Communicative Action*, Habermas (1990) draws a parallel between his explanation of the development of the

capacities required for communicative action (CA) and the stages of moral development in Laurence Kohlberg's model. According to Habermas, the agent's willingness to assume the communicative attitude (CA), following the ethics of discourse, requires a more advanced development of various subjective capacities, including cognition, than the development required for the strategic attitude (SE).

Figure 3 is a readaptation of the conceptual scheme previously adapted by Ostrom (2005), based on Denzau and North (2000). The original scheme is inscribed in the approach of the so-called "cognitive institutionalism" that seeks to understand the interactions between cognition, belief systems and institutions, and how these interactions affect economic performance (Mantzavinos; North; Shariq 2004).

Cognitive institutionalism (CI) adopts a view of the mind as a complex structure that actively interprets and simultaneously classifies the signals received by the senses. Updated interpretations and categorizations outline a series of "mental models" that participants make about the action situation. These mental models are understood as flexible knowledge structures that "evolve gradually throughout cognitive development to organize our perceptions and maintain control of our memories" (Mantzavinos; North; Shariq 2004, p. 76).

Proponents of CI adopt a so-called "pragmatic" notion of mental models. For them, these models are understood as expectations (or predictions) of the results of actions, which agents make *before* receiving feedback from the environment (Figure 3).

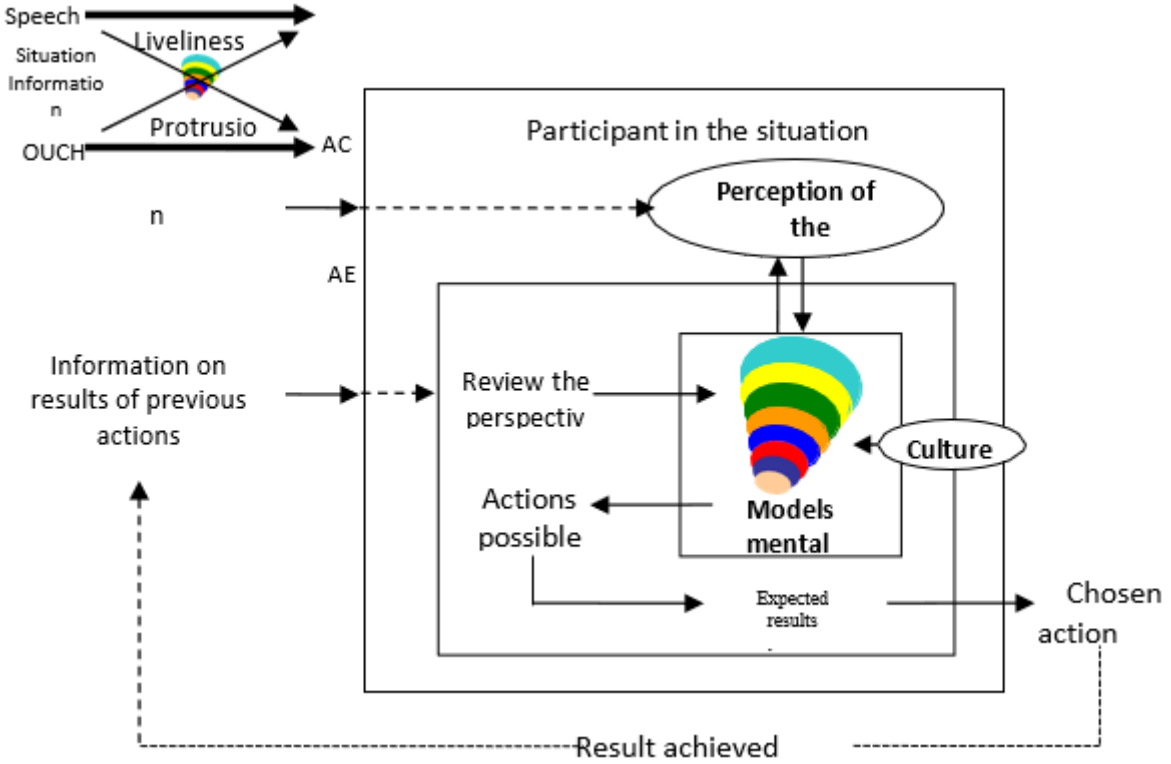
In this formulation, a "belief" is a relatively "crystallized" mental model, which has become stabilized "when environmental *feedback* confirms the same model many times." A "belief system" is simply an interconnection of beliefs, or crystallized mental models, and which may be more or less consistent with the signals of the environment.

An important part of the difficulties of social organization thus comes from the fact that the agents have different beliefs (interpretations) regarding the situation of the action, and tend to support their opinions of how the situation should be managed in *equally divergent normative* orientations. It is at this point that communication emerges as a potentially useful resource. The idea is that repeated opportunities for communication can help in the convergence of mental models and thus facilitate the coordination of collective action (cf. Denzau; North, 2000). When considering the agents' communications, Frohlich and Oppenheimer (2001) point to the *liveliness* and *salience* of the facts observed in the environment as elements that would explain the selective aspect of attention and the "contents" of communications. Ostrom (2005), in turn, incorporated these aspects into the original scheme of Denzau and North (2000).

However, because the instrumental conception of rationality, underlying the analysis of the CI, does not support the idea of the rational justification of normative principles, the CI needs to

admit that no argumentation is capable of substantiating the *validity* of the proposed norm, nor of demonstrating its superiority of principles in relation to any viable alternatives. Inevitably, verbal communication is then reduced to its strategic form (Figure 2), starting to fulfill only the function of a vehicle for the exchange of impressions (beliefs, opinions) about the situation, without imposing any effective restriction on the actions chosen by the participants. To overcome this limitation, we used, in Figure 3, Habermas' typology of elementary and social actions (Figure 2), instead of exclusively strategic communication, admitted in the scheme adopted by Ostrom (2005).

Figure 3 – The structuring of inner development (lines and stages) conditions the perception and review of perspectives on the arena of action, as well as the attitudes of the participants towards communication opportunities.



Source: Authors' configuration. Adapted from Ostrom (2005)

As previously pointed out, this incorporation also implies integrating into the scheme the perspective of developmental psychology, that is, the notions of lines and stages of inner development, supported by the paradigms of phenomenology and psychological structuralism. On the one hand, this means that the participants *do not* have full freedom to review their perspectives on the situation, since the information about the external situation, the perception of what is lively and salient, and the understanding of the results of previous actions, all this is built, and rebuilt, according to the capacities of each *stage* of development. Although it can be admitted, as Ostrom (1999) does, that all participants possess "limited and very similar capacities for reasoning and discovering the structure of complex systems" (pp. 25-26), the moral nature of the choices and behaviors required to

sustain local rules of governance in collective action dilemmas again highlights the differences in the participants' degrees of inner development.

According to developmental psychology, the revision of perspectives on the situation (Figure 3) is conditioned by its own "laws" of subjective transformation, which are the basis of structuring in stages and are not altered by external conditions (Wilber, 2000). This helps to answer the question posed by Mantzavinos, North and Shariq (2004), regarding the persistence of mental models, beliefs and belief systems, supposedly inconsistent with the signs of the environment.

For our purposes, however, it is more important to highlight the convergence of psychological models regarding the gradual *reduction of egocentrism* and the corresponding *increase in the willingness to cooperate*, as basic characteristics of the process of inner development (Wilber, 2000). Working under controlled conditions, in laboratory experiments, Meyer (2010) produced evidence that these qualitative transformations, evaluated according to Clare Graves' (1970, 2005) model of psychosocial development, have significant implications for participants' choices in proposing and respecting (or violating) norms capable of solving collective action problems. The current challenge is to take this knowledge to field conditions, and to verify its relevance in facilitating participatory processes, with an emphasis on dialogue and the "exchange of knowledge", as preached by the current methodological orientation for ATER/ATES services.

METHODOLOGY

The extension of the knowledge generated in research on collective action, and the opportunity for its review and development, are at the center of the activities of the UFRA Program in Agrarian Reform, of the Federal Rural University of the Amazon (UFRA). In line with the general methodological guidelines for the services of ATER/ATES (INCRA, 2010), the actions of the Program are guided by the pedagogical conceptions and strategies of the "GESPAR" method of facilitating participatory processes (BNB/UNDP, 1995; BNDES/UNDP, 2000).

GESPAR's methodological strategy combines three simultaneous macro-processes (BNDES/UNDP, 2000, p. 47): *inter-institutional consultation*, *training* and *monitoring*. The inter-institutional consultation actions aim at the formation of partnerships and the construction of institutional arrangements relevant to the purposes and scope of the intervention. These actions are supported by training processes for institutional and community development, with a focus on the construction of polycentric governance arrangements that enable citizen participation and social control of the state, rescuing the representative legitimacy of social, political, cultural and religious organizations.

In addition to institutional and community development, the training includes the productive and environmental dimensions. The first emphasizes entrepreneurial potential and qualifications for

managerial and operational roles. In this (productive) dimension, the GESPAR methodology seeks to develop the spirit of solidarity, stimulating forms of business cooperation (BNDES/UNDP, 2000, p. 48). In the environmental dimension, GESPAR works on "the awareness and commitment of individuals, companies, social organizations and institutions to environmental problems and their possibilities of solutions [...]" (BNDES/UNDP, 2000, p. 49). In combination with productive capacities, sustainable alternatives of enterprises (eco-enterprises) are sought that internalize the vision of environmental rationality to the mechanisms of business management.

In the four dimensions of training (institutional, community, productive and environmental), the gender focus is addressed in a transversal way. Recognizing the *differences* between men and women that underlie the principle of gender equality, all actions facilitated by the GESPAR method seek to "identify needs and opportunities to improve women's access and/or control over resources and benefits" associated with development processes (BNDES/UNDP, 2000, p. 49).

As for the pedagogical focus of the training, the GESPAR method has as theoretical and philosophical references the School of Genetic Psychology of Vygotsky, Luria and Leontiev, the Genetic Epistemology of Piaget, the Pedagogical Method of Paulo Freire and the Critical Theory of Society (Frankfurt School). These references guide an ethical, as well as pedagogical, effort that places the human being at the center of development actions and identifies the need to reflect on the paradigms, symbolic thinking, language and mental structures of societies as the greatest challenge of today for the understanding of contemporary and future phenomena in the world (BNDES/UNDP, 2000, p. 50-51). From this perspective, the GESPAR methodology seeks to develop capacities for collective action and support "the construction of citizen empowerment so that the benefits of development are focused on human fulfillment" (ibid, p. 48).

Regarding operationalization, the stages of the GESPAR method are grouped into three main phases: (1) preparatory phase (PRE), (2) the application phase of the basic methodology (AMB) and (3) the specific technology transfer phase (TTE) (Figure 4). In the PRE phase, inter-institutional consultation, mobilization and awareness of communities and their organizations are highlighted. The PRE phase also includes technical seminars and training of the team of facilitators in the procedures and techniques used in the stages of the AMB phase. In addition to the technical aspects, these trainings aim to strengthen the humanistic training of the facilitators, with emphasis on the attitudes and postures required by the new conception of ATER/ATES, commented on in the introduction.

The AMB phase consists of eight stages grouped into five "workshops" and three "field cycles". The workshops are events held with groups called "local teams", generally composed of participants and collaborators from pre-existing social organizations, whether formal (associations, cooperatives) or informal (e.g. youth group, women's group). The field cycles consist of actions

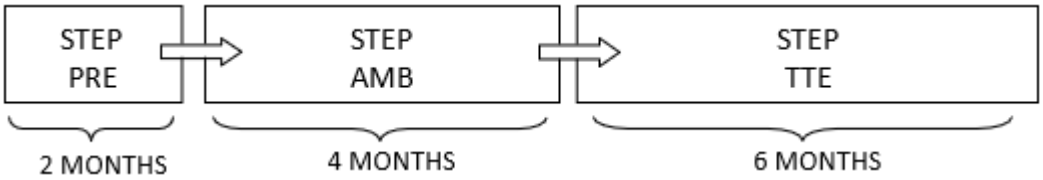
developed with the broad universe of producers and families associated with the organizations of local teams.

The GESPAR method provides for three field cycles, aimed at: (1) building the group's "conceptual project" or "vision of the future", to be supported by the social organization and local teams; (2) identify and diagnose the productive resources available to families through the use of the "property notebook" or "batch notebook", and (3) instrumentalize the management (planning, evaluation and control) of activities, through the "management notebook".

With the local teams, the GESPAR method provides for the holding of five workshops, with the following themes: (1) participatory diagnosis, to identify the forces in favor and against the realization of the collective project (vision of the future), (2) planning of immediate actions, to solve the main "bottlenecks" identified in the diagnosis, (3) evaluation of the performance of the existing social organization, (4) preparation of the Integrated Development Plan, and (5) organization and management of the collective enterprise.

In the TTE phase (transfer of specific technologies), the teams of facilitators start to act less as executors and more as articulators of training opportunities in specific techniques and knowledge, offered by specialized entities and institutions, in the various areas of interest of the organizations (BNB/UNDP, 1995, p. 32). In general, content related to production, credit, marketing, agribusiness, markets, education and environmental legislation, among other subjects considered relevant, in accordance with local situations, is included here.

Figure 4 – The three phases of the GESPAR methodology.



Source: BNB/PNUD (1995, p. 10)

RESULTS AND DISCUSSION

In this section, we organize our reflections on the challenges of participatory elaboration of Development Plans in agrarian reform settlements (PDAs) and the social management of the ATES Program. The categories proposed by the Bloomington School (Figure 1 and Chart 1) guide an analysis in which individual involvement in participatory planning and social management efforts are seen as dilemmas of collective action for the provision of *public goods*. The categories of Habermasian analysis (Figure 2) and developmental psychology are used to broaden our understanding of the potentialities and limitations associated with the opportunities for dialogue around these issues, created within the scope of participatory methodologies.

SOCIAL, ECONOMIC AND POLITICAL ENVIRONMENT (SOC)

As highlighted in the introduction, the political context in which the II National Plan for Agrarian Reform (II PNRA) and the new National Policy for Technical Assistance and Rural Extension (PNATER) are inscribed is largely favorable to the use of participatory planning and management methodologies. This orientation is clearly reflected in the methodological references of the Technical, Social and Environmental Advisory Program (ATES) of INCRA (MDA/INCRA, 2010).

These methodologies are also important for the current policy, which prioritizes the qualification of existing settlements and their insertion into local economies, rather than the expansion of the number of new settlements. On the other hand, cuts and contingencies of resources from the Union budget recurrently compromise INCRA's ability to coordinate and finance the ATES Program. Contingencies such as those observed in 2012 impose discontinuities that are highly detrimental to mobilization processes and participation in planning work.

SYSTEMS (SREC), RESOURCE UNITS (REC) AND RELATED ECOSYSTEMS (ECO)

As a nationwide Plan, the II PNRA encompasses a variety of integrated ecological and social systems (SESIs), with different degrees of complexity, involving different types of resources and histories of use. Even within the area under the jurisdiction of the Regional Superintendence of Pará (INCRA/SR-01), the diversity of ecosystems in areas of agrarian reform settlements imposes a substantial challenge to the ability of providers to offer adequate ATES services in different circumstances.

The formal processes of creating new settlement projects require clear demarcation of boundaries and detailed inventories of existing physical and biological resources. These delimitations and surveys should facilitate the social organization required for the participatory elaboration of the PDA. However, with respect to the peri-urban settlements with which we have worked, the histories of previous land use have negatively impacted the productivity of ecological systems and impose greater difficulties for the agroecological transition, encouraged by the ATES policy.

Located in a region considered to be of high biological importance and a priority for corrective measures (MMA, 2007), these settlements are marked by major changes in primary forest cover and many social and environmental problems. Alternatives to deal with these limitations should emerge from detailed studies carried out in partnership with the settlers, carried out by multidisciplinary teams, using participatory planning methodologies (CONAMA, 2006). However, in peri-urban areas, with higher labor opportunity costs, the low productivity of the systems acts as a disincentive to self-organization (Chart 1). Involvement in the development of complex plans, such as PDAs, is also limited by factors related to governance systems and user attributes.

GOVERNANCE SYSTEMS (SGOV)

The document presenting the II PNRA (MDA, 2004) suggests that the success of the Plan depends on the ability to make operational a complex system of polycentric governance, in which multiple actors, public and private, interact, with different levels of action, authority and responsibility. In the area of government, in addition to the Ministry of Agrarian Development (MDA), where the II PNRA was prepared, five other ministries are mentioned due to their important roles in supporting the Plan (MDA, 2004, p 16.): Ministry of Development and Social (MDS), Ministry of the Environment (MMA), Ministry of Health (MS), Ministry of Education (MEC) and Ministry of Culture (MinC). Various programs with both complementary and overlapping purposes are developed in these ministries and operationalized by complex bureaucratic structures that further fragment authority and responsibility.

To address environmental issues, the National Council for the Environment (CONAMA) published a Resolution (No. 387/2006) that defines the requirements for the environmental licensing of agrarian reform projects. Among other studies to be produced in different phases and circumstances of the licensing process, the Settlement Development Plan (PDA) stands out as a fundamental instrument for planning the social and spatial organization of projects "in strict accordance with the diversity of cases" (CONAMA, 2006). The preparation of the PDAs requires the collection of data and the production of detailed information on the physiographic, social, economic, cultural and environmental aspects particular to each settlement project. The PDA should function as a basic instrument for the formulation of technical projects and other activities to be carried out in the areas of the settlement, serving as a reference for the monitoring and control of development actions.

In accordance with the guidelines established in the National ATER Policy (PNATER), CONAMA Resolution 387 explicitly requires that the PDAs be prepared by multidisciplinary teams, together with the settlers, using participatory planning techniques and action research methodology (CONAMA, 2006). However, as a formal part of environmental licensing, the PDA takes on the character of a *public good*, since the lack of individual involvement, in the effort to prepare it, does not exclude the individual from the benefits generated. To this "free rider effect" are added others, associated with the organizational structures for the management of the ATES Program, the training of technicians and the forms of financing and control of the execution of outsourced ATES services.

According to PNATER guidelines, the Brazilian System of Technical Assistance and Rural Extension (SIBRATER) aims to organize ATER/ATES services in a decentralized way, covering a series of committees, councils and other representative entities. The organizational structure for SIBRATER's social management includes a National Committee for Technical Assistance and Rural Extension and a National Council for Sustainable Rural Development (CONDRAF). In addition,

there are also State Councils for Sustainable Rural Development (CEDRS), ATER Chambers and ATER thematic networks, formed by governmental and non-governmental organizations.

Sá *et al* (2012) draw attention to the challenges arising from this complex organizational structure for the management of the ATES Program. As a basis for the experience of the ATES articulators in Rio Grande do Sul, the authors point to conflicts in the systems of activities, authority and communication. As for advisory activities, they point to distances between the needs of the settlers, what can be offered by the providers and what the INCRA technicians want. In the dimension of authority, they call attention to problems arising from the duality of command to which the executors of ATES are subjected, simultaneously integrated into the organizational structures of the providers and the management model proposed by INCRA. In the face of these conflicts, the authority of the paying source (INCRA) tends to prevail over the autonomy of the providers (Sá *et al*, 2012, p. 152). In this context, the flexibility necessary to place ATES services genuinely at the service of family projects, as preached by PNATER, conflicts with the management model that aims to ensure maximum control of the application of public resources, through the establishment of goals and predetermined contractual terms.

Caporal (2005), in turn, mentions four groups of problems with negative impacts on participatory planning in agrarian reform projects. He considers that the public institutions of ATER/ATES services are not yet prepared to provide and evaluate the results of actions aimed at promoting the agroecological transition recommended by the National Policy. He extends this criticism to most private ATER providers, and suggests that the development of said ATER social networks is not advancing due to competition for limited public funds. The author blames, at least in part, the education system for this situation. He suggests that professional training in most rural universities is still linked to the technology transfer model of the "green revolution", based on didactic methods that contribute neither to the attitude nor to the knowledge required by the new PNATER.

The agrarian reform governance system is also hampered by failures in the operational performance of the public entities responsible for the policy at different levels. These problems negatively affect credit authorization, infrastructure provision, recruitment and financing of services, monitoring and control of the performance of ATES providers. Such operational failures are often linked to structural deficiencies, including insufficient human resources.

USERS (U) AND INTERACTIONS (INT)

The expanded conception of agrarian reform, proposed in the II PNRA, also implies a great expansion of the target audience. Reaching about 50 million people, according to the document (MDA, 2004), this public includes small family farmers, people living in rural and traditional

riverside communities, those affected by dams and other large infrastructure works, non-indigenous inhabitants of indigenous areas, rural workers and rural youth, as well as other segments of a population linked to agricultural activities who live in rural municipalities.

To a certain extent, the existing modalities of access to land contribute to reducing the heterogeneity of beneficiaries, especially in ethnic settlements (indigenous and Afro-descendant). Also, the so-called "agroecological forms" of access to land favor symmetry in terms of the degree of dependence on resources and the technology used. Among the traditional forms of access to land, land regularization tends to favor knowledge of the systems (SESIs).

On the other hand, the dilemmas associated with user attributes and interactions are more important to the beneficiaries of expropriated land. It turns out that land expropriation processes are usually forced by occupations of rural properties led by social movements. The socioeconomic and cultural heterogeneity of people living in camps and occupied areas increases as these movements recruit people on the outskirts of cities to strengthen pressure on the authorities and get public attention.

Considering the settlements with which we have been working, located in the surroundings of the metropolitan region of Belém, social organization is hampered by the unequal dependence on common resources. On the one hand, this disproportion results from an autonomous spatial organization, which takes place even before the formal constitution of the settlements. On the other hand, the proximity to urban centers generates alternative income opportunities for settlers less inclined to agricultural work. This situation greatly complicates participation in planning processes. Conflicts between users and between users and employees of INCRA often end in threats or effective aggression.

The political struggle to expropriate land belonging to political figures and multinational corporations also favors the demobilization of collective action once political targets are achieved. At this point, the different social movements and organizations began to dispute ascendancy over the settlers grouped around competing leaderships. Although the development of subgroups helps both the exchange of information and the processes of deliberation (Ostrom, 2002), the polarization of interests undermines the governance of collective actions and the creation of norms for the management of common resources.

RESULTS (RES)

The philosophical foundations and guidelines of the II PNRA and the new PNATER imply profound changes in the conventional evaluation criteria used to measure the performance of the policy.

Sparovek (2003) highlights the need to go beyond the usual information on the number of families settled and the total value of the reformed area. The evaluation of the effectiveness of land reorganization must take into account the number of families actually living in the settlements, in relation to their total capacity, the number of abandoned and agglutinated parcels, in addition to the relationships between the total area of the settlements and the areas of Legal Reserve (RL), Permanent Protection Areas (APP) and areas that are not being used productively (Sparovek, 2003).

In addition to these indicators, the evaluation of the performance of the II PNRA should add a series of qualitative information. Sparovek's estimates for the qualitative aspects of land reform performance include three composite indicators. The first (quality of life) characterizes the basic infrastructure (housing, electricity, roads, water supply), the family's access to health services, education and transportation in the settlements, after government intervention. The second (social organization) refers to the relations between the settlements and the external community (for example, commercialization) and the internal social organization (participation in associations and cooperatives, for the collective use of common areas). The third (operational efficiency) basically measures the release of support resources and the provision of basic infrastructure, provided for by the ATES Program.

The main instruments to improve these qualitative dimensions are the qualified ATES services and the operational efficiency of INCRA, including the monitoring and auditing of contracted ATES services. The evaluation of the effectiveness of participatory planning and management methods represents one of the greatest challenges of the new Policy. In our view, the recourse to referendum, by the settlers, of proposals prepared by the technicians, is a very unsatisfactory palliative that, in essence, betrays the real purposes of genuinely participatory methods.

New challenges arise due to structural limitations, at INCRA, to assess the effective quality of participatory methods and the degree of empowerment achieved in the field. In addition, the quality of monitoring activities is hampered by the weakness of internal controls.

CONCLUSIONS

The Brazilian government's official support for participatory planning and social control methodologies, aimed at promoting the sustainable development of rural territories, has a deep philosophical significance, in terms of political superstructure (worldview). This new posture expresses a paradigm shift in relation to the authoritarian style of planning and execution that prevailed throughout the military period (1964 - 1985).

At the same time, after the neoliberal policy that prevailed between 1990 and 2003, the II PNRA and the reconstruction efforts of the Brazilian System of Technical Assistance and Rural Extension (SIBRATER) reveal that the State has regained leadership in socioeconomic development

in a direction that contradicts that which would be dictated by purely economic interests and market forces.

Rising above the conventional dichotomy between government and market, polycentric governance systems emerge as a form of adaptive organization with the potential to balance government command power, preventing it from becoming authoritarian and corrupt. In the search for this balance—fundamental to the very existence of democratic societies—participation and social control become key elements. As Aligica and Boettke (2009) indicate, the discussion of polycentrality is not only related to "legitimacy", the distribution of "power" and the multiplicity of "decision-making centers", established in a general system of "rules", but also to a discussion of fundamental political values, leadership and coalition formation.

However, the form of participation needed to engage in political activities aimed at generating public goods and maintaining the polycentric (democratic) order is difficult to achieve. This type of participation requires more than self-interest advocacy and is strongly associated with the development of moral conscience (Meyer, 2010). Consistent with regular classroom practice, observations produced both in the laboratory (Ostrom, Gardner; Walker, 1994; Meyer, 2010) and in the field suggest that no institutional engineering can function as a substitute for true willingness to cooperate. The concepts of authority, justice and the motivations that shape the choices of individuals, as well as their expectations in relation to the behavior of others, are subject to internal processes of transformation of cognitive structures that cannot be changed by simple social reinforcement (Maslow, 1954; Graves, 1970; Kohlberg, 1981; Selman, 1980; Heiner, 1983; Habermas, 1990; Wilber, 2000).

An important aspect in discussions about the viability of polycentric systems of governance and the effectiveness of participatory planning methods is neglected if the role of cognition, value systems, and moral choices is not properly considered. Without this consideration, there is a risk of causing all efforts at social organization and participation in decision-making processes to degenerate into exchanges of personal advantage and detestable battles for undeserved power and prestige. This type of collapse of the public interest, which should guide participatory planning in agrarian reform settlements, jeopardizes not only the protection of environmental resources of global interest, but also the very spirit of democratic government and social control on which the II PNRA is based.

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Milton Melo charitable education and neurofunctional association: An approach to care for students with Autism Spectrum Disorder (ASD)

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Rosiomar Lobato Pinheiro Rodrigues[1] and Mílvio da Silva Ribeiro[2]

ABSTRACT

Due to the complexity and diversity of symptoms presented by people with Autism Spectrum Disorder (ASD), it is essential to have specialized institutions committed to the development and well-being of these individuals. The municipality of Abaetetuba, located in the Amazon region of Brazil, stands out for its rich biodiversity of fauna and flora. ABENMM is a non-profit entity founded by 20 families, with the support of neurologist Madacilina Melo Teixeira and professor Abdinaldo Rodrigues Ferreira. Maintained through an agreement with the municipal government, the association operates in the philanthropic, cultural, welfare, educational and rehabilitation areas. This article aims to present an analysis of the services offered, through direct observation and analysis of the results obtained, through an interview with an employee, it seeks to understand how this institution contributes to the development of its students with disabilities, among these, those with Autism Spectrum Disorder-ASD.

Keywords: Association, Autism, Student, Development.

[1] Teacher linked to the Secretariat of State and Education (SEDUC-PA); Master's student in the Graduate Program in Educational Sciences at the Inter-American Faculty of Social Sciences – (FICS); Specialist in Afro-Brazilian History and Culture – Montenegro College; Autism Specialist - FAVENI; Specialist in Institutional Psychopedagogy With Qualification in Special Education – Montenegro College; Specialist in Special Education – Montenegro College; Graduated in Pedagogy from the Latin American Faculty of Education - FLATED; Graduated in History – UFPA; Bachelor in History – UFPA.
E-mail: rosiomar1000@gmail.com.
ORCID: https://orcid.org/0009-0001-6910-8509

[2] Doctor in Geography from the Graduate Program in Geography at the Federal University of Pará – PPGEO/UFPA. Professor at the Faculty of Theology, Philosophy and Human Sciences Gamaliel – FATEFIG.
E-mail: milvio.geo@gmail.com
ORCID: https://orcid.org/0000-0002-1118-7152

INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurobiological condition that affects the communication, social interaction and behavior of individuals who have it, given the complexity and diversity of symptoms presented by people with ASD, it is essential to have specialized institutions committed to the development and well-being of these individuals (Brinster, *et al*., 2022). In this context, the Milton Melo Beneficent Association of Education and Neurofunctional stands out as a reference in the care and promotion of the inclusion of students with Autism Spectrum Disorder (ASD).

The municipality of Abaetetuba, located in the Amazon region of Brazil, stands out for its rich biodiversity of fauna and flora. With a population of 119,152 inhabitants, including individuals with Autism Spectrum Disorder (ASD), the Milton Melo Beneficent Association of Education and Neurofunctional was created on August 28, 2004, provisionally located at Rua Magno de Araújo, nº 2076, in the São Lourenço neighborhood, in Abaetetuba, state of Pará. ABENMM is a non-profit entity founded by 20 families, with the support of neurologist Madacilina Melo Teixeira and professor Abdinaldo Rodrigues Ferreira.

Maintained through an agreement with the municipal government, the association operates in the philanthropic, cultural, welfare, educational and rehabilitation areas. Regularly registered with several bodies, such as CNPJ, Term of Source, Inep Code, registration with municipal councils and licensing certificates, ABENMM has an agreement with the city hall through the development term No. 09/2021, according to Law No. 13,019 of July 31, 2014 – Regulatory Framework.

This article aims to present an analysis of the services offered by the Milton Melo Beneficent Association of Education and Neurofunctional, highlighting its practices, approaches and methodologies aimed at students with ASD. Through direct observation and analysis of the results obtained, through an interview with an employee, it is sought to understand how this institution contributes to the cognitive, emotional and social development of its students, promoting their autonomy and quality of life.

THE IMPORTANCE OF THE MILTON MELO BENEFICENT ASSOCIATION OF NEUROFUNCTIONAL EDUCATION: ITS RECEPTION AND PEDAGOGICAL AND PSYCHOPEDAGOGICAL EVALUATION

The Milton Melo Beneficent Association of Education and Neurofunctional is a specialized institution that offers services to the target audience of Special Education, including people with Autism Spectrum Disorder (ASD). In its initial service process, the association welcomes individuals, followed by pedagogical or psychopedagogical evaluation, depending on whether or not they have a report.

During the reception, conducted by the social worker, the individuals are referred to pedagogical screening if they have a report, in order to evaluate their development and direct them to the necessary care. Those without a report are referred for psychopedagogical evaluation, which includes the preparation of reports and referral for evaluation with a neurologist, in order to obtain a diagnosis and the respective report.

These welcoming and evaluation processes are essential as an initial step for the care and referral of individuals with ASD, allowing the identification of their special educational needs (Brites, 2019). It is essential to assess the constraints in cognitive, linguistic, behavioral, emotional, social, physical, and self-care skills in order to understand the specific needs of each person with ASD.

Welcoming and social evaluation are extremely relevant in charitable associations, as they are the first steps to understand the needs and demands of the people served, as well as to establish a bond of trust and support. Social reception is the initial process of reception and active listening to individuals who seek the services of the charitable association. It aims to welcome, comfort and guide users, providing a welcoming and empathetic environment. During this stage, professionals can identify emergency issues, traumas, difficulties, and immediate needs of individuals, which is essential to direct the next steps of care (Brinster, *et al*., 2022)

Couto *et al*., (2019) states that social assessment consists of analyzing and understanding the social, economic, and emotional situation of users, as well as identifying available resources and potential vulnerabilities. Through this assessment, it is possible to draw up a personalized and effective intervention plan, considering the specificities of each case and the best ways to promote the well-being and social inclusion of those served.

By promoting reception and social evaluation in a careful and systematic way, charitable associations are able to establish a relationship of trust and respect with users, which is fundamental for the success of interventions and for the development of effective and assertive actions. In addition, these processes contribute to the construction of a support network and to the promotion of citizenship, autonomy and quality of life of the people served (Gama; Fernandes, 2019).

Pedagogical and psychopedagogical evaluation is used to identify the educational and psychopedagogical needs of the individuals served. Within the scope of charitable associations, pedagogical evaluation is used to assess the educational progress, cognitive abilities and learning difficulties of the beneficiaries. This evaluation helps the institution's professionals to plan more effective and personalized pedagogical interventions, aiming to meet the specific educational needs of each beneficiary (Oliveira, 2020)

On the other hand, the psychopedagogical evaluation is carried out to understand not only the educational issues, but also the emotional, social and family aspects that can influence the learning

process of those served. This comprehensive assessment is essential to diagnose possible learning disorders and develop intervention plans that consider the individual needs of each beneficiary (Conssoline; Lopes, 2019).

By employing pedagogical and psychopedagogical assessment in the context of charitable associations, professionals can ensure a more holistic and personalized approach to serving beneficiaries, promoting inclusion, full development and autonomy of the people served. These evaluation processes are essential to direct the actions and interventions of associations in order to more effectively and adequately meet the educational and psychopedagogical needs of those who benefit from them (Brinster, *et al*., 2022)

SPECIALIZED EDUCATIONAL SERVICE OF THE MILTON MELO BENEFICENT ASSOCIATION OF NEUROFUNCTIONAL EDUCATION: A PRIMORDIAL TOOL

The Specialized Educational Services (SES) are services aimed at students with disabilities, global developmental disorders and high abilities/giftedness, which aim to promote school inclusion and ensure the access, participation and learning of these students in the educational environment. SEA aims to offer specialized educational support that complements and/or supplements the training of students, considering their specific needs (Couto *et al*., 2019)

In the case of autistic children, specialized educational services play a crucial role in their development and learning, some important points about the importance of these services for autistic children include Personalized service, SEA is personalized according to the specific needs of each autistic child, taking into account their abilities, difficulties and individual characteristics (Gama; Fernandes, 2019).

SEA can provide adequate stimuli for the development of cognitive, social, emotional and motor skills of autistic children, contributing to their progress and learning. SEA seeks to eliminate barriers that can hinder the full participation of autistic children in the school environment, offering pedagogical and accessibility resources that favor their engagement and interaction (Conssoline; Lopes, 2019)

By offering specialized support, specialized care contributes to the inclusion of autistic children in the school context, promoting their autonomy and independence, both inside and outside school. In addition to benefiting the autistic child, SEA can also offer support and guidance to families, helping them to better understand their child's needs and collaborate more effectively in their educational development (Brinster, *et al*., 2022)

The Milton Melo Beneficent Association of Neurofunctional Education, in accordance with article 5 of Resolution CNE/CEB No. 04/09, offers Specialized Educational Service to students with disabilities, including those with Autism Spectrum Disorder (ASD). This is due to the fact that the

aforementioned article highlights that Specialized Educational Service (SES) can be carried out in SEA centers in the public network or in community, confessional or philanthropic non-profit institutions, as is the case of the Beneficent Association of Neurofunctional Education Milton Melo.

In addition, the Specialized Educational Service (SES) offered at ABENMM is also based on the 2008 Political-Legal Frameworks for Special Education in the Perspective of Inclusive Education, which emphasizes the role of SEA to identify, elaborate, and organize pedagogical and accessibility resources to eliminate barriers to the full participation of students, considering their specific needs, including students with Autism Spectrum Disorder (ASD).

In this way, the SEA offered at ABENMM differs from the activities carried out in the regular classroom, not being a substitute for schooling, but rather complementing and/or supplementing the students' education aiming at autonomy and independence at school and beyond, as highlighted by interviewee 01 (BRASIL, 2010, p. 21.22).

Thus, ABENMM offers this service in a complementary way to the training of students with disabilities and autism spectrum disorders. In addition, autistic students also have at their disposal at the institution the AEE, which is intended for students from the municipal public school network, since Milton Melo's objective is to expand the offer of SEA and receive students from the municipal network.

THE IMPORTANCE OF IMPLEMENTING INDIVIDUALIZED PEDAGOGICAL ASSISTANCE (API) IN THE EDUCATIONAL CONTEXT: STRATEGIES, BENEFITS AND CHALLENGES

In the current educational context, the implementation of Individualized Pedagogical Service (API) has stood out as a fundamental approach to promote meaningful and inclusive learning for all students. API refers to an educational practice that aims to meet the specific needs of each student, taking into account their abilities, interests, learning paces, and cognitive styles. (Gama; Fernandes, 2019).

According to Conssoline and Lopes, (2019) one of the key strategies of the API is the personalization of teaching, which involves the adaptation of the curriculum, teaching methodologies and assessments according to the individual characteristics of each student. This can be done through the use of differentiated teaching materials, the diversification of teaching strategies, the use of educational technologies, and the promotion of practical and interactive activities.

The benefits of API are diverse and impact not only students' academic performance, but also their personal and social development. By receiving personalized service, students feel more motivated, engaged, and confident in their learning process. In addition, API contributes to the promotion of educational equity, allowing all students to have access to quality education, regardless of their individual differences (Couto *et al*., 2019)

Brinster, *et al*., (2022) say that, however, API implementation also presents challenges that need to be overcome, one of the main challenges is training teachers to work effectively with the diversity of student needs. Educators need to be prepared to identify the individual demands of each student and to develop pedagogical strategies appropriate to these needs.

The authors Gama and Fernandes (2019) point out that another challenge is to guarantee the necessary infrastructure for the implementation of the API, such as the availability of differentiated educational resources, the support of specialized professionals, the adequacy of physical spaces, and the integration of assistive technologies.

The implementation of Individualized Pedagogical Service (API) is essential to promote inclusive and quality education that meets the needs of all students. Through the personalization of teaching, it is possible to enhance student learning, promote educational equity, and prepare them for the challenges of the twenty-first century. To this end, it is essential to invest in the continuing education of teachers, in the adequacy of school infrastructure, and in the strengthening of educational policies that value the diversity and individuality of each student (Conssoline; Lopes, 2019).

According to the employee of the Beneficent Association of Education and Neurofunctional Milton Melo, the Individualized Pedagogical Service (API) was implemented in 2023 with the objective of providing personalized assistance to students with Autism Spectrum Disorder (ASD) who face difficulties in adapting to the collective environment and, consequently, are not performing well in a group. The interviewee points out that the need to offer the API arose due to the difficulties of interaction and sensory issues faced by these students, which were impacting their performance in the group teaching environment.

The implementation of the API involves the creation of specific classes of individualized service, where a teacher works directly with the student, at scheduled and scheduled times, in order to meet the specific needs of each student with ASD. This approach aims to provide a more appropriate and welcoming environment, allowing for a personalized pedagogical intervention that considers the particularities and challenges faced by students with ASD.

Thus, as evidenced in the interviewee's report, the Individualized Pedagogical Service (API) is intended to exclusively serve students with Autism Spectrum Disorder (ASD), in order to offer personalized educational support that takes into account the specificities and needs of these students, thus contributing to their academic and personal development.

NEUROFUNCTIONAL STIMULATION AND THE FUTURE IMPLEMENTATION OF ABA CARE

Neurofunctional stimulation is a therapeutic approach that has been increasingly used in the treatment of children and adults with autism spectrum disorder (ASD). This approach aims to promote the neurological and functional development of the individual through activities that stimulate the central nervous system, aiming to improve cognitive, motor, social, and emotional skills. (Oliveira, 2020)

For autistic students, working on their neurofunctional area is extremely important in their overall development, in addition to promoting the development of fine and gross motor skills, performing this stimulation can help improve motor coordination, proprioception, balance and posture, aspects that are often challenging for people on the autistic spectrum (Brinster, *et al*., 2022)

In addition, this stimulus can also have a positive impact on the cognitive development of autistic students, helping to improve attention, concentration, memory, problem-solving skills, and abstract thinking. This can facilitate academic learning and the development of daily living skills (Gama; Fernandes, 2019).

In the social and emotional aspect, neurofunctional stimulation can contribute to the development of social interaction and communication skills, areas in which many people with ASD face challenges. By improving emotional regulation, sensory perception, and response to environmental stimulus, this therapeutic approach can help autistic students feel more comfortable and engaged in different social contexts (Couto *et al*., 2019)

It is important to emphasize that neurofunctional stimulation should be part of a comprehensive and individualized therapeutic approach for each autistic student, considering their specific needs, abilities, and challenges. In addition, collaboration between professionals from different areas, such as occupational therapists, physiotherapists, speech therapists, and psychologists, is essential to ensure an effective and integrated intervention (Oliveira, 2020)

Encouraging neurofunctional development has a significant relevance in the development and well-being of autistic students, contributing to the improvement of several areas of their neurological, cognitive, motor, social and emotional functioning. Through an appropriate and personalized therapeutic approach, it is possible to enhance the skills and capabilities of autistic students, promoting a higher quality of life and inclusion in different contexts (Conssoline; Lopes, 2019)

According to the employee belonging to the Beneficent Association of Neurofunctional Education Milton Melo, the history of the institution began with the practice of Neurofunctional Stimulation, in which families took their children in search of a method that involved standardization activities, circuit and sensory activities. However, due to the new guidelines of Inclusive Education, philanthropic institutions began to assume a new role. Through agreements, they also began to offer

Specialized Educational Service (AEE), in accordance with Article 5 of Resolution CNE/CEB No. 04/09. Thus, the Milton Melo Beneficent Association of Neurofunctional Education had to adapt, no longer limiting itself only to the Neurofunctional aspect.

In this context, it is observed that the Milton Melo Beneficent Association of Neurofunctional Education, with the objective of promoting global development, including the autonomy and independence of students with disabilities, including those with Autism Spectrum Disorder, continued to offer Neurofunctional Stimulation. This was done through programs that involve sensory and motor activities, following the human development profile known as the neurological reorganization method (Glenn. 1989).

According to Glenn (1989), this method is based on human potential, stimulating six specific areas frequently, intensely and lastingly: vision, hearing, touch, mobility, language and manual competence. The official mentioned that the stimulation of these six areas, together with the pedagogical complementation, has the purpose of allowing students to experience their development process with interventions adapted to their individual needs.

In addition to the Neurofunctional stimulus, the Association is looking for the implementation of the ABA method. The ABA (Applied Behavior Analysis) method is an evidence-based therapeutic approach that has been widely used in the treatment of individuals with Autism Spectrum Disorder (ASD). Initially developed by B.F. Skinner in the 1950s, the ABA method is based on behavior analysis and aims to promote positive and significant changes in people's behavior, teaching social, communication, academic, and daily living skills (Couto *et al*., 2019)

Oliveira (2020) the importance of the ABA method for students with ASD lies in the fact that it is highly individualized, adaptable, and data-based. Through careful analysis of the individual's behavior, therapists can identify specific and measurable goals for each student, creating personalized intervention plans that aim to improve skills that are important for their development.

The ABA method emphasizes early and intensive intervention, which is crucial for children with ASD, as the earlier treatment begins, the greater the chances of significant improvements in the child's development and quality of life. The intensive approach involves frequent and prolonged sessions, usually with a specialized therapist, aiming to maximize practice and learning time (Brinster, *et al*., 2022)

Another key aspect of the ABA method is positive reinforcement, through the use of rewards and positive feedback, this instrument helps to increase desirable behaviors and reduce problematic behaviors, creating an environment conducive to learning and development (Brites, 2019).

This methodology is an evidence-based approach, which means that its effectiveness has been proven through scientific research and clinical studies. This gives parents, therapists, and

professionals confidence that they are utilizing a validated and effective intervention to help individuals with ASD reach their full potential (Conssoline; Lopes, 2019)

The ABA method has become an indispensable tool in the treatment and education of individuals with ASD, providing an individualized, evidence-based, and intensive approach that aims to promote the development of essential skills and improve the quality of life of these people. It is important to emphasize that the ABA method must be applied by qualified professionals and in partnership with the family, thus ensuring a comprehensive and effective approach to the treatment of ASD (Gamma; Fernandes, 2019).

According to the association's employee, a study is underway to implement a service focused on applied behavioral intervention (ABA) to meet the specific needs of our students with autism. To ensure the success of this service, they are waiting for the acquisition of the necessary resources before starting practical activities. The purchase of essential materials to offer a truly specialized service, aimed at the development of social and behavioral skills so important for students with autism, has already been included in the work plan. Once the resources are available, it will be possible to start the ABA program in an effective and impactful way in the school community.

MULTIDISCIPLINARY TEAM OF THE MILTON MELO BENEFICENT ASSOCIATION OF NEUROFUNCTIONAL EDUCATION AND THE ACTIONS CARRIED OUT

Educational services for students with autism spectrum in associations can benefit from the presence and collaboration of several professionals, each playing a key role (Couto *et al*., 2019)

Within the Association's Habilitation and Rehabilitation Integration Center (NIHR), as mentioned by the interviewed employee, several services are offered, such as welcoming, screening, evaluation, home care, individualized therapeutic care, family guidance, and multiprofessional care. These services are provided according to the specific needs of the students and involve professionals such as speech therapist, psychologist, social worker, psychopedagogue, physiotherapist and pedagogue, by appointment.

In the context of this center, the speech therapist plays a fundamental role. Her responsibilities at ABENMM include participating in the evaluation process, case studies and preparation of reports in collaboration with the institution's multiprofessional team. In addition, she advises the teaching action, providing speech-language pathology guidance that helps in the pedagogical process in the classroom, contributing to student learning. The speech therapist assists individually and in groups the students who need speech therapy intervention for the development of voice, speech, hearing and language, whenever necessary.

Other activities performed by the speech therapist in the consultations include carrying out prevention work related to written, oral, voice and hearing communication, guidance to families to

optimize the educational process, participation in technical or administrative meetings when called, collaboration in specific issues of their area of training and knowledge that contribute to the development and learning of students, as well as the organized and updated maintenance of the records of the students served.

The speech therapist plays a key role in supporting the communication and language of children with autism. They can help develop verbal and nonverbal communication skills, as well as work on articulation, voice, and fluency issues. In the educational context, the speech therapist can help create strategies to improve communication and social interaction of students with autism (Gama; Fernandes, 2019).

The psychologist, as highlighted by the employee, plays a fundamental role in the context of ABENMM in relation to psychology services. Their responsibilities include participating in the evaluation process, case studies, and reporting in collaboration with the institution's multiprofessional team. In addition, the psychologist collaborates on specific issues in her area of training and knowledge that contribute to the development and learning of students.

Within the scope of her knowledge, the psychologist advises the teaching action by conducting home visits with the objective of studying the psychosocial context of the families of the students served. She also guides families, seeking to optimize the educational process and contribute to the balance and adjustment in family relationships. In addition, the psychologist participates in technical or administrative meetings when necessary and summoned, keeping the records of the students served organized and updated. She assists students who need psychological support individually and in groups, assessing their psychological issues and specific needs in an attentive and professional way.

The psychologist is essential to help understand the behavior and emotional needs of students with autism. They can provide emotional support, aid in the development of social and emotional skills, and offer strategies for coping with behavioral challenges. The psychologist can also collaborate with parents and teachers to create an appropriate and welcoming learning environment. (Couto *et al*., 2019)

In the professional area of social work, the social worker is identified as the person responsible for providing social assistance, as mentioned by interviewee 01. The participation of the social worker in the evaluation process, case studies and preparation of reports together with the institution's multiprofessional team stands out as a crucial contribution. In addition, she collaborates with specific issues in her field of training and knowledge, which are fundamental for the development and learning of students.

The social worker also plays the role of advising the teaching action, providing social assistance guidance based on her specialized knowledge. It seeks to include users and their families

in the social protection system, public services and in the social and assistance network, according to the needs of the students. In addition, it contributes to the rescue and prevention of the integrity of users, promoting the improvement of the quality of life.

Through extensive support, information, guidance and referral actions, the social worker works together with the association's families with a focus on quality of life, the exercise of citizenship and the social inclusion of students with disabilities, including those with Autism Spectrum Disorder (ASD). In this context, the home visits carried out aim at the study and socio-family monitoring of the students served.

The social worker offers individual and group support to students and their families who need welcoming, active listening, support, guidance, promotion of coexistence, reconstruction and strengthening of family and community bonds. The role of social work as a mediator between the needs of users and the available services is also highlighted, seeking to ensure the effectiveness, efficacy and quality of these services, promoting citizenship, participation and social control in the institution (Conssoline; Lopes, 2019)

In the context of the actions and functions of the Milton Melo Beneficent Association of Neurofunctional Education, professionals, including the social educator and the psychopedagogue, are responsible for evaluating students in search of reports. Students without a report undergo psychopedagogical evaluation (interview, anamnesis), answer questionnaires with their families, participate in playful interventions with games and are referred, if necessary, for treatment of conditions such as ADHD, ODD and dyslexia at the health center or at SEMEC (psychosocial).

After the psychopedagogical evaluation in the association, the professional investigates the student's learning process, seeking to understand the origin of the difficulties. The evaluation process begins with a history interview to collect essential data about the child, including their development, medical history, school history, family dynamics, and other relevant factors. The objective is to identify elements that may be creating obstacles to the learning process.

For the authors Gama and Fernandes, (2019) the social educator can contribute to the inclusion and social integration of the student with autism. They can help develop social skills, promote positive interactions with peers, and support participation in extracurricular activities, the social educator plays an important role in creating an inclusive and supportive environment for the student with autism.

The psychopedagogue is responsible for identifying learning difficulties and developing strategies to overcome them. In the case of students with autism, the educational psychologist can adapt the curriculum, use specific methodologies and offer individualized support to meet the student's educational needs. They can also collaborate with other professionals to ensure a multidisciplinary and integrated approach (Conssoline; Lopes, 2019).

In summary, collaboration between speech therapists, psychologists, social educators and psychopedagogues is essential to provide effective and comprehensive educational care for students with autism spectrum in associations. Each professional brings specific skills and knowledge that, when combined, can promote the overall development and well-being of these students.

The actions developed by ABENMM are educational, cultural, charitable and recreational, these activities cover sensory, psychomotor, educational aspects, as well as the production of didactic/tactile pedagogical materials and the realization of continuing education, such as multiprofessional intervention courses and annual seminars, pedagogical workshops, home and school visits, class councils, pedagogical shift, psychopedagogical evaluation, pedagogical hour/activity, training with families (Embrace Project) and parties on commemorative dates.

These actions aim to provide new learning opportunities for students in the target audience of Special Education, including students with Autism Spectrum Disorder (ASD), thus contributing to their integral development.

In addition, ABENMM promotes pedagogical articulation with the regular schools of the students served, through lectures in schools, assistance to teachers and forwarding of reports from students, including those with ASD. It is observed, through the observations and the political-pedagogical project, the inclusion of families, with periodic meetings with parents and/or guardians, aiming at the participation and involvement of the entire school community in the educational process, in order to improve the quality of teaching for the benefit of all students, including those with ASD.

Another relevant action carried out by ABENMM for the benefit of students with ASD and their families is the Continuous Provision Benefit (BPC), where the social worker promotes reception, evaluation and referrals related to the BPC issue, as mentioned by the employee.

FINAL CONSIDERATIONS

Throughout this study, the Milton Melo Beneficent Association of Education and Neurofunctional demonstrated an exemplary approach in the care of students with Autism Spectrum Disorder (ASD). The performance of the multidisciplinary team proved to be essential for the development and progress of these students, promoting a comprehensive and personalized approach for each individual. The benefits of this team are vast and impactful, ranging from expert assessment to the implementation of personalized intervention strategies.

The actions developed by the institution proved to be effective in serving and supporting students with ASD. The personalisation of the intervention plans, the close monitoring and the constant evaluation of progress have allowed an environment conducive to the development of these

individuals. In addition, the promotion of social inclusion, the partnership with families and the continuous training of the team were key elements for the success of the interventions.

The neurofunctional stimuli applied by the Milton Melo Association demonstrated significant results in the cognitive, motor and emotional development of students with ASD. The use of innovative therapeutic approaches, such as sensory stimulation, sensory integration and occupational therapy, contributed to the improvement of the quality of life and autonomy of these individuals. Attention to the specific needs of each student and the constant adaptation of therapeutic practices were key to the success of these stimuli.

The approach of the Milton Melo Beneficent Education and Neurofunctional Association for students with ASD stands out for its holistic, personalized and innovative approach. The multidisciplinary team, the actions developed and the neurofunctional stimuli applied proved to be fundamental for the progress and well-being of these students, highlighting the importance of an integrated and specialized performance in the care of individuals with special needs such as ASD.

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Algae: The green solution for basic sanitation

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Keyla Nunes Farias Gomes[1], Julianne Soares Pereira[2], Geovana Espíndola Jardim[3], Patrícia Soares Santiago[4], Leandro Rocha[5] and Robson Xavier Faria[6]

ABSTRACT

The use of algae in basic sanitation and water purification is a promising approach. Algae, both microalgae and macroalgae, are photosynthetic organisms that play a crucial role in removing nutrients and contaminants from effluents. They have been extensively studied and applied in water and wastewater treatment systems due to their effective and sustainable ability to absorb nutrients such as nitrogen, phosphorus, and organic pollutants. Compared to conventional methods, algae-based technologies offer significant environmental benefits, including lower energy consumption and reduced reliance on chemicals. Successful examples worldwide, such as in Qingdao (China) and San Francisco (USA), demonstrate successful implementation cases, resulting in improved water quality, the promotion of sustainability, and the protection of aquatic ecosystems. In the future, it is essential to continue investing in research and development to optimize these technologies and promote their global implementation, aiming to address global challenges related to freshwater scarcity and water pollution.

Keywords: Natural filtration, Water sustainability, Water treatment, Environment, Public health.

[1] Federal University of Rio de Janeiro - Graduate Program in Plant Biotechnology and Bioprocesses, Health Sciences Center.
Environmental Health Assessment and Promotion Laboratory, Oswaldo Cruz Institute.
Natural Products Technology Laboratory, Fluminense Federal University.
[2] Fluminense Federal University - Postgraduate Program in Sciences and Biotechnology, Niterói, RJ, Brazil.
Environmental Health Assessment and Promotion Laboratory, Oswaldo Cruz Institute.
Biomolecules Laboratory, Vale da Ribeira School of Agricultural Sciences/UNESP, Campus Registro, São Paulo, Brazil.
Natural Products Technology Laboratory, Fluminense Federal University.
[3] Environmental Health Assessment and Promotion Laboratory, Oswaldo Cruz Institute.
[4] Biomolecules Laboratory, Vale da Ribeira School of Agricultural Sciences/UNESP, Campus Registro, São Paulo, Brazil.
[5] Federal University of Rio de Janeiro - Graduate Program in Plant Biotechnology and Bioprocesses, Health Sciences Center.
Natural Products Technology Laboratory, Fluminense Federal University.
[6] Fluminense Federal University - Postgraduate Program in Sciences and Biotechnology, Niterói, RJ, Brazil.
Environmental Health Assessment and Promotion Laboratory, Oswaldo Cruz Institute.

INTRODUCTION

INTRODUCTION TO ALGAE AND THEIR ENVIRONMENTAL IMPORTANCE

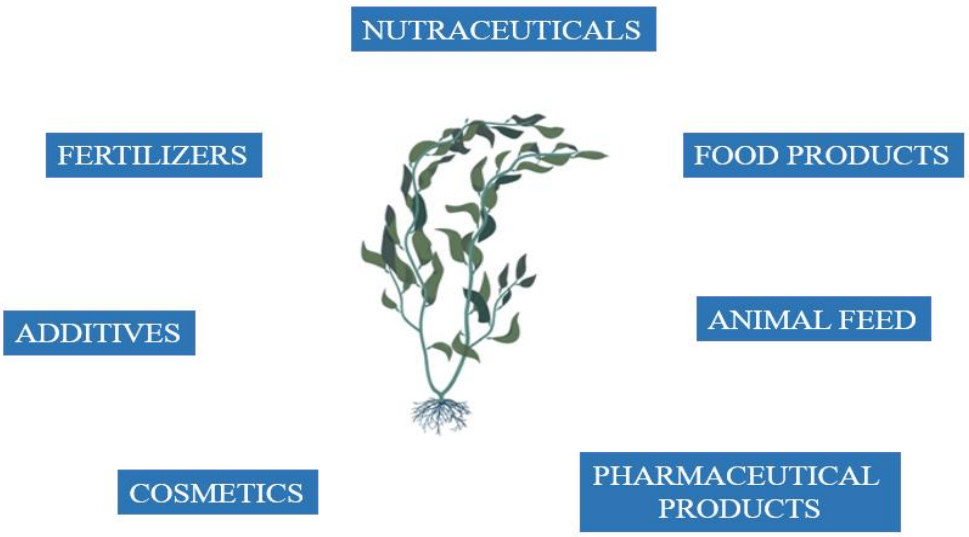
Algae are photosynthetic, eukaryotic aquatic organisms that can be unicellular or multicellular and can be identified based on color, shape, and life cycle (Chaudhary, 2020). These organisms are the primary producers of biomass in marine environments and possess various bioactive substances that can be used for human and animal health (Pereira and Faria, 2023; Pereira et al., 2023).

They can be classified into macroalgae and microalgae. Macroalgae are large photosynthetic plants that can be observed without a microscope. Microalgae are microscopic and have a significant impact on and are important for their applications. Algae are classified based on the release of their pigmentation into brown (phaeophytes), green (chlorophytes), and red (rhodophytes) categories (Chaudhary, 2020; Lee and Ryu, 2021; Pereira et al., 2023).

Algae play an essential role in the environment. These organisms contribute in various ways, primarily through nutrient absorption, coastal defense against hazardous waves, and carbon reduction in the environment (Araújo et al., 2021).

Algae are currently being utilized in various commercial sectors. They are widely established in Asia as food and supplements due to their nutritional and therapeutic properties. They are also used in the pharmaceutical, biomedical, and biotechnological industries. Other applications include livestock feed supplements, fertilizers, biostimulants for plants, and bioproducts in the cosmetics industry (Figure 1) (Araújo et al., 2021).

Figure 1: Applications of algae in various commercial and industrial sectors.



Source: Image created using the Biorender application.

BASIC SANITATION CHALLENGES

Water is an essential resource for supporting a healthy life. Its importance transcends its fundamental role as a raw material in several industries, including pharmaceutical, petrochemical, food, agrochemical, oil and gas industries, in addition to playing a crucial role in agriculture and domestic uses (Abdelfattah et al., 2023; Rashid et al., 2021).

Increased water consumption inevitably results in greater volumes of wastewater effluents. Although more than 70% of the Earth's surface is covered by water, only 3% is potable for human consumption, while the remaining 97% is salt water. Approximately four billion people globally face water shortages for at least one month each year (Rashid et al., 2021).

The direct disposal of contaminated water from these applications represents severe environmental risks and is a growing concern due to the diversity of contaminants present. There are different sources of water pollution, such as sewage, pesticides, industrial waste, and agricultural waste (Abdelfattah et al., 2023).

In addition to the environmental impacts caused by inadequate disposal, the lack of basic sanitation causes significant problems in several socioeconomic sectors, especially in health areas. Diseases transmitted by effluent waste affect both the directly exposed population and those indirectly impacted. Therefore, awareness and the implementation of preventive measures, such as adequate sewage treatment, are essential to promote healthier and more sustainable living conditions (Almeida et al., 2020; Costa et al., 2022).

In Brazil, the predominant system is the sewage network, which is the most suitable option. However, other realities include the use of rudimentary and septic tanks and direct dumping into rivers, streams, and springs, which contaminate soil and groundwater, which are vital sources for human life. Therefore, it is crucial to study the construction of sewage treatment plants, aiming to achieve a more adequate level of disposal of this waste into the environment at a more affordable cost, which can positively impact citizens' quality of life. Basic sanitation is fundamental to human well-being, as it controls public health by eliminating health risk factors and promoting social and environmental conditions that are conducive to good survival (Costa et al., 2022).

POTENTIAL OF ALGAE IN WATER PURIFICATION

Several technologies, including biological, physical, and chemical methods, have been applied to remove contaminants in aquatic environments. Advanced technologies include adsorption, chlorination, activated carbon filtration, membrane processes, advanced oxidation, photocatalysis, and the use of nanomaterials. However, these methods have significant limitations, such as high costs associated with the choice of adsorbent, expensive chemical reagents, and the potential generation of secondary pollutants in the processes (Li et al., 2021; Li et al., 2022).

Biological treatments offer distinct benefits compared to physical and chemical methods and are more environmentally sustainable and economically viable (Rambabu et al., 2020). Algae, for example, are known for their remediation capabilities in aquatic ecosystems due to their rapid growth cycle, sensitivity to pollutants, and stress response mechanisms (Li et al., 2022).

Algal-based remediation techniques have been explored since the 1950s to remove nutrients and dissolved carbon from sewage, especially because of their efficiency without additional energy demand for pollutant removal (Li et al., 2022 part 1), unlike conventional approaches such as microfiltration and sludge activation, which require high energy consumption (Li et al., 2022). Furthermore, microalgae-based technology has successfully removed up to 65% of organic microcontaminants, such as pesticides and antibiotics, from groundwater (Ferrando and Matamoros, 2020). The main removal pathways in algae have been identified, including bioadsorption, biodegradation, bioaccumulation, photodegradation, volatilization, and hydrolysis.

Bioadsorption is a physicochemical process in which biological materials, such as algal cell walls or extracellular polymeric substances (EPSs), are used to remove substances, including antibiotics, from wastewater. These interactions are passive and nonmetabolic, allowing high-efficiency removal of contaminants. For example, after lipid extraction, *Chlorella vulgaris* and *Chlorella* sp. demonstrated significant adsorption of different compounds, such as metronidazole and cephalexin, respectively (Nguyen et al., 2020; Li et al., 2022).

Biodegradation is a fundamental process in nature and environmental engineering in which complex organic compounds are transformed into simpler products through enzyme-catalyzed reactions. This process occurs mainly in microorganisms, which use compounds as a source of energy or nutrients, resulting in the complete or partial decomposition of these organic materials (Tiwari et al., 2017; Li et al., 2022).

According to the table below, several applications of biological processes involving algae are highlighted, highlighting the versatility and usefulness of methods such as biodegradation and bioadsorption in solving environmental and industrial challenges, with a focus on removing these pollutants.

Table I: Biological techniques using algae to remove different pollutants.

Algae	Mechanism	Pollutant
Chlamydomonas sp.	Biodegradation	Tetracycline
Tetraselmis suecica	Biosorption	Tetracycline
Chlamydomonas sp	Biodegradation	sulfamethoxazole
Chlamydomonas sp.	Biodegradation	Sulfadiazine
Spyrogira sp.	Biodegradation	sulfathiazole
Cenadesmus dimorphus	Bioadsorption	Ciprofloxacin
Clorela vulgar	Biodegradation	Levofloxacin
Clorela vulgar	Biodegradation	Azithromycin
Microcystis aeruginosa	Biodegradation	Amoxicillin
Scenedesmus chlorelloides	Biodegradation	molybdenum
Chlamydomonas	Biodegradation	Lead
Chlorella vulgaris	Biodegradation	zinc, cadmium and copper
Oscillatoria spp	Biodegradation	zinc, cadmium and copper

Source: Adapted from Li et al., 2022.

According to Pedro and collaborators (2021), the genera *Chlamydomonas*, *Chlorella* and *Scenedesmus* stand out as frequent choices for bioassays designed to evaluate the toxicity of various contaminants in aquatic ecosystems. These microalgae provide effective and cost-effective assessments of environmental risks and play a crucial role in improving water quality. In addition to detecting toxicity, these species have the ability to significantly contribute to the purification of water bodies, especially by absorbing nitrite and phosphorus, making them valuable tools in environmental management initiatives and monitoring water resources.

ALGAE BIOFILTRATION TECHNOLOGIES

Algae are fundamental to the environment because they are primary producers and help maintain life in rivers, seas, and oceans. They are also crucial for biogeochemical cycles such as carbon and sulfur cycling. Furthermore, they benefit economically in diverse countries and are used for different purposes (Vidotti, 2004).

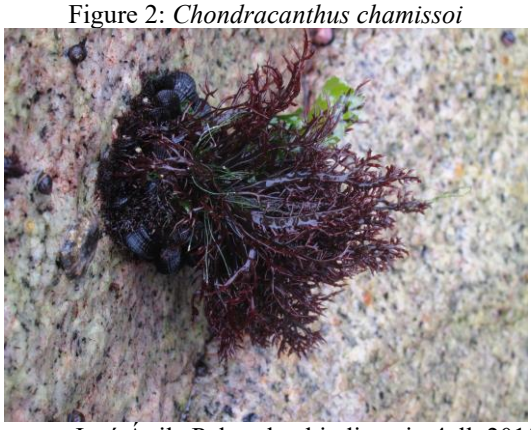
In the context of algae biofiltration in basic sanitation, the use of these organisms is highly promising due to their effectiveness in water purification. Integrating algae into treatment systems makes it possible to significantly reduce the need for chemicals, thus minimizing the adverse environmental impacts associated with their use. Furthermore, this approach promotes sustainable

practices and represents an economically advantageous option for companies and governments (Vidotti, 2004).

Heavy metals, microorganisms, toxic chemicals, and fertilizers are examples of contaminants that spill into rivers and seas and that end up for human consumption when there is no adequate basic drinking treatment, causing serious damage to the population and the ecosystem (Trajano et al., 2020).

There has been an increase in the number of biotechnological studies in recent years, intending to generate profitable and more accessible basic sanitation; thus, research has emerged on the design of biofiltration systems using algae to remove these pollutants. An example is the Peru institution's study, where the macroalgae *Chondracanthus chamissoi* (Figure 2) was evaluated for removing heavy metals, such as chromium, using the biotechnological biofilter method. This study was successful in achieving a 100% absorption rate. In addition to being easily found in nature, algae can efficiently bind to metal ions (Siccha, 2014).

Figure 2: *Chondracanthus chamissoi*



Source: José Ávila Peltroche, biodiversity4all, 2015.

Some studies have used this system to reuse water, as in aquaculture. When water changes during certain periods of the year to remove nitrate and to save money, water is recirculated for management, benefiting from biofiltration by macroalgae, such as *Chaetomorpha* sp. (Holm-Hansen et al., 1963; Xu et al., 2010).

In 2019, Archimede Ricerche, an Italian company, developed a project to use algae to treat wastewater. In the project, during the water purification phase, *Spirulina* microalgae are placed in tanks next to the wastewater to be cultivated. Thus, in a favorable environment, with sunlight and pollutants that enrich their growth, such as nitrate, algae are stored through photosynthesis in their tissues and develop. This absorption contributes to water purification against contaminants and increases the amount of algae biomass available for other purposes, such as cosmetic production (Euronews, 2019).

PRACTICAL APPLICATIONS AND CASE STUDIES

Use of algae in water and sewage treatment plants

The use of algae in water and sewage treatment plants has gained prominence as a promising approach for improving water quality and reducing the load of pollutants in water bodies. Algae, particularly microalgae and macroalgae, have demonstrated unique abilities to remove nutrients and organic contaminants from effluents (Ho et al., 2019).

In water treatment plants, algae are often integrated into biofiltration systems to remove contaminants such as nitrogen, phosphorus, and organic matter. These photosynthetic organisms can absorb nutrients dissolved in water during their growth, helping to remove them from effluents efficiently. Furthermore, algae can contribute to water oxygenation through photosynthesis, further improving treated water quality (Smith et al., 2018).

In sewage treatment, algae also play an essential role in removing nutrients and purifying effluents. Algal lagoon systems, for example, are used to increase algal biomass in large volumes of wastewater, where algae absorb nutrients such as nitrogen and phosphorus for growth. Some common examples of microalgae used include *Chlorella*, *Spirulina*, *Scenedesmus,* and *Chlamydomonas*. Among macroalgae, species such as *Ulva*, *Gracilaria,* and *Enteromorpha* can be used. Furthermore, the photosynthesis carried out by algae in lagoons also helps to oxygenate water and decompose organic matter (Wang et al., 2020).

The successful implementation of algae-based water and wastewater treatment technologies depends on the appropriate selection of algal species, the efficient design and operation of systems, and the optimization of environmental parameters to promote algal growth and activity. Continuous research in this area aims to develop more effective and sustainable systems, aiming to meet the growing demands for water and sewage treatment around the world while promoting the conservation of water resources and the protection of the environment (Henderson et al., 2019; Xu et al., 2017; Martin et al., 2021).

Examples of communities or regions that have successfully implemented algae-based sanitation solutions

Several communities and regions worldwide have adopted innovative algae-based sanitation solutions to improve water quality, reduce pollution, and promote environmental sustainability. A notable example is the city of Qingdao, China, which implemented a sewage treatment system based on algae ponds. This system uses algae to remove nutrients such as nitrogen and phosphorus from sewage effluents, promoting the recovery of high-quality water for reuse and minimizing the discharge of pollutants into local water bodies (Xu et al., 2017).

Another success story is the pilot project in San Francisco, United States, where algae were integrated into drinking water treatment. In this project, algae were used in biofiltration systems to remove organic contaminants and improve the quality of treated water, contributing to reducing the use of chemical products and protecting local water resources (Smith et al., 2018).

Several coastal communities have also explored algae cultivation as part of effluent treatment and nutrient recovery strategies. For example, Noli in Italy has adopted macroalgae farming systems in its coastal waters to absorb nutrients and improve water quality while promoting sustainable aquaculture and marine ecosystem protection (Giacometti et al., 2020).

These examples highlight the potential of algae-based sanitation solutions to address the environmental and public health challenges associated with water and wastewater treatment. By adopting innovative and sustainable approaches, these communities demonstrate how algae can play a crucial role in improving water quality and promoting the health and well-being of local populations (Xu et al., 2017).

CONCLUSION AND PERSPECTIVES

In summary, the benefits of basic sanitation for algae are remarkable. As discussed throughout this chapter, algae have shown a unique ability to purify water, remove nutrients and pollutants from wastewater, and improve water quality in water and wastewater treatment systems. Furthermore, its application reduces the dependence on chemical products and promotes more sustainable practices in waste treatment.

In the future, the role of algae in continually improving sanitation and water quality is promising. With technological advances and growing awareness of the importance of environmental preservation, algae-based sanitation solutions are expected to be increasingly adopted in communities and regions worldwide. This trend is driven by the need to address global environmental challenges such as the scarcity of drinking water and water resource pollution.

Therefore, it is essential to continue investing in the research and development of technologies related to algae to optimize their effectiveness in water and sewage treatment. Furthermore, public education and awareness about the benefits of algae in basic sanitation are essential to promote its widespread implementation and ensure the long-term sustainability of these solutions.

In short, algae are fundamental for promoting public health, preserving the environment, and ensuring access to clean and safe water. By continuing to explore their potential and innovatively integrate them into sanitation systems, we can achieve significant advances in water quality and promote human well-being on a global scale.

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Conventional treatment in the removal of microcontaminants

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Eliomar Gotardi Pessoa[1]

ABSTRACT

Water treatment plants have been commonly designed to promote high removal of particulate matter and microorganisms, with a significant predominance of conventional potabilization technology, comprising the stages of coagulation, flocculation, sedimentation or flotation, filtration and disinfection in different tanks.

Keywords: Treatment, Removal, Microcontaminants.

[1] Master in Engineering and Sustainable Development -UFES.

INTRODUCTION

Water treatment plants have been commonly designed to promote high removal of particulate matter and microorganisms, with a significant predominance of conventional potabilization technology, comprising the stages of coagulation, flocculation, sedimentation or flotation, filtration and disinfection in different tanks (LIMA et al., 2014).

In addition to this treatment setup, other technologies have been applied on a full-scale basis for particulate removal. The clarilockor is one of them used in large water treatment plants around the world. The technology has a flocculation zone in the center and a decantation zone circumscribing it, so the entire flocculation and decantation process is carried out in a single compartment (SAXENA; BRIGHU; CHOUDHARY, 2020).

The sludge blanket clarifier, considered a high-rate clarification technology, is another applied example, considered a solids contact system and also combines flocculation and decantation in one unit. Sludge blanket clarifiers maintain a large volume of flocculated solids within the unit, which improves flocculation by stimulating collisions between particles (JOHNSON, 2014).

The concern with different contaminants present in water bodies has led to comparative studies regarding the efficiency of these processes. The presence of natural organic matter (MON) is an example due to the potential for the formation of toxic chlorinated compounds and the possible development of other toxic compounds if the coagulation process is not efficient. Emerging contaminants are also evaluated in conventional clarification processes, mostly finding the inefficiency of coagulation in removal (HUANG et al., 2019; LIMA et al., 2014). Different mechanisms can be addressed from these researches, including varying treatment techniques, and with this information evaluate possible proposals for the removal of these pollutants.

OBJECTIVE

To carry out a brief discussion on water clarification using the conventional clariloculator and sludge blanket clarifier, comparing them with bench scale analyzing the mechanisms and then evaluating their potential characteristics in the removal of the emerging contaminant, diclofenac. To support the discussion, the main article chosen was by Saxena et al 2020 and other pertinent articles were searched in the Web of Science, Scopus and ScienceDirect databases.

DISCUSSION

CLARIFICATION IN TURBIDITY REMOVAL, TOC, DOC – USE OF CLARILOCULATOR AND SLUDGE BLANKET CLARIFIER

In a recent study, Saxena et al, (2020), evaluated two pilot plants, a conventional clarichlorinator and a sludge blanket clarifier for the removal of turbidity and TOC in synthetic

waters prepared using kaolin and humic acid as a source of turbidity and organics, respectively. In addition, parameters such as DOC, zeta potential, pH and alkalinity, and UV

254 were measured before and after treatment to compare the removal efficiencies and mechanisms of the two pilot plants. Studies were tested for inlet turbidity ranging from 0 to 20 NTU and inlet TOC ranging from 0 to 10 mg. $^{L-1}$ to check its efficiency for the variable characteristics of the raw water. The performance of the pilot plants was also compared with the bench-scale jar tests.

High basicity polychloride (PAC) was used as the coagulant. Optimal doses were obtained by performing pitcher tests for each combination of inlet turbidity and OCD. The pH of the synthetic waters was alkaline, to simulate the raw water in a region of India that has 17 UN, TOC of the surface waters usually ranges from 2 to 10 mg/L and average pH of 8.40, alkalinity 180-205.

The rapid mixing system consisting of a mechanical impeller for rapid mixing is designed for a detention time (td) of 1 min and a gradient value (G) of 400 s $^{-1}$. In the conventional clarichlorinoculator (CC) the flocculation zone is designed for slow mixing through a radial flow impeller designed for a detention time (td) of 30 min, G-value of ~30 s

$^{-1}$ and surface overflow rate of ~30m3 /m2 /day. **The sludge blanket clarifier (CML)** designed with a much smaller base area and more depth. The clarifier is designed for a detention time of 30 minutes and rate of ~70 m3 /^{m2}/day and a G value of ~2.5 s $^{-1}$.

The scheme used by Saxena et al, (2020) is presented in Figure 1. A more detailed scheme using the same processes was presented by Srivastava; Brighu; Gupta (2020) for different parameter conditions, rapid mixing with G of 600 s-1 and td of 30s, flocculation zone *td* of 20 min and G of 40 $^{s-1}$ and CML designed to treat of 8000L/d (Figure 2). The objective focused on evaluating the efficiency of technologies for low turbidity waters, simulating raw water with pH 7.5 and alkalinity of 228. Therefore, the samples for evaluation ranged from 0-10 UT. In addition, the post-filtration efficiency on 20 µm filter paper was also evaluated.

Figure 1- Process schematic and accessories of pilot plant, (a) conventional clarifier and (b) sludge blanket clarifier (SAXENA; BRIGHU; CHOUDHARY, 2020)

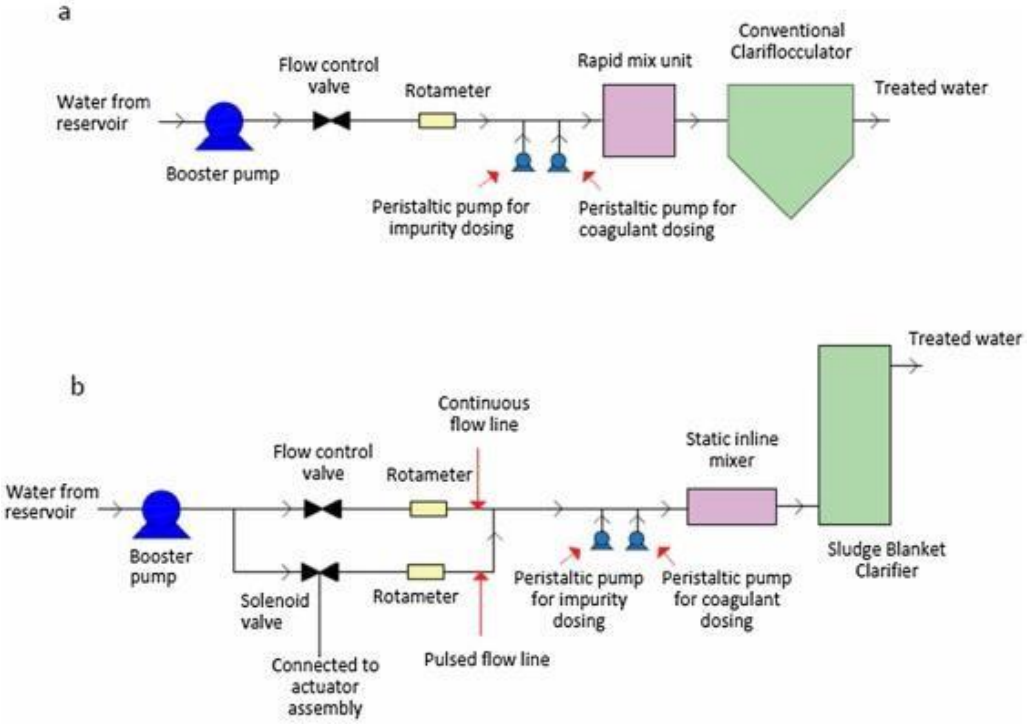
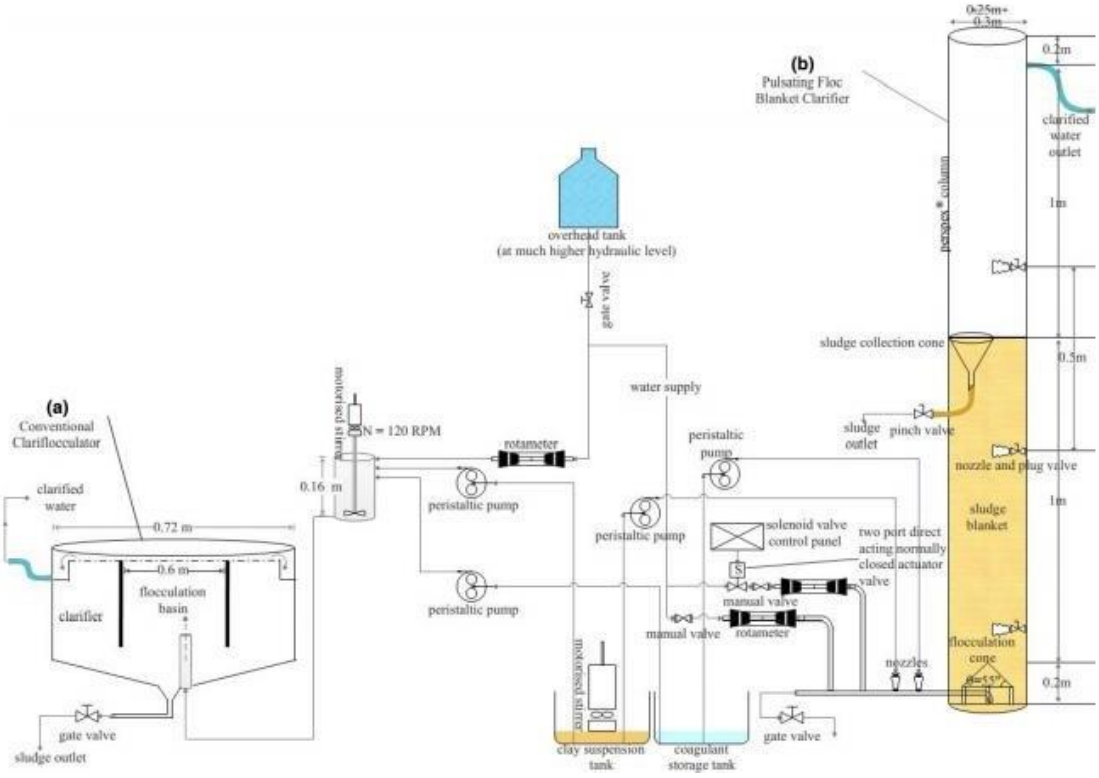


Figure 2- Process schematic and accessories of pilot plant, (a) conventional clarifier and (b) sludge blanket clarifier (SRIVASTAVA; BRIGHU; GUPTA, 2020).



Turbidity Removal

According to Saxena; Brighu; Choudhary (2020), in general, the percentage of turbidity removal increased with the inlet turbidity (Table 1).

Table 1 – Turbidity removal as a function of inlet turbidity.

Input turbidity	CC	CML	In Test (JT)
5 UNT	43–54%	20–57%	- DC 30% less efficient than JT - CML 39% less efficient than JT
10 UNT	52–75%	36–77%	
15 UNT	63-79%	57-72%	
20 UNT	76-84%	60-81%	

For COT at entry, the decrease was more significant for CML than for WC (Table 2). Overall, the percentage of removal was higher for CC than CML; and for both systems there was a decrease in turbidity removal efficiency as the input TOC increased, but again it increased because the TOC was too high. On average, compared to the test jar result, the removal efficiency was 30% lower for CC and 39% lower for CML.

Table 2 – Percentage of turbidity removal as a function of inlet TOC

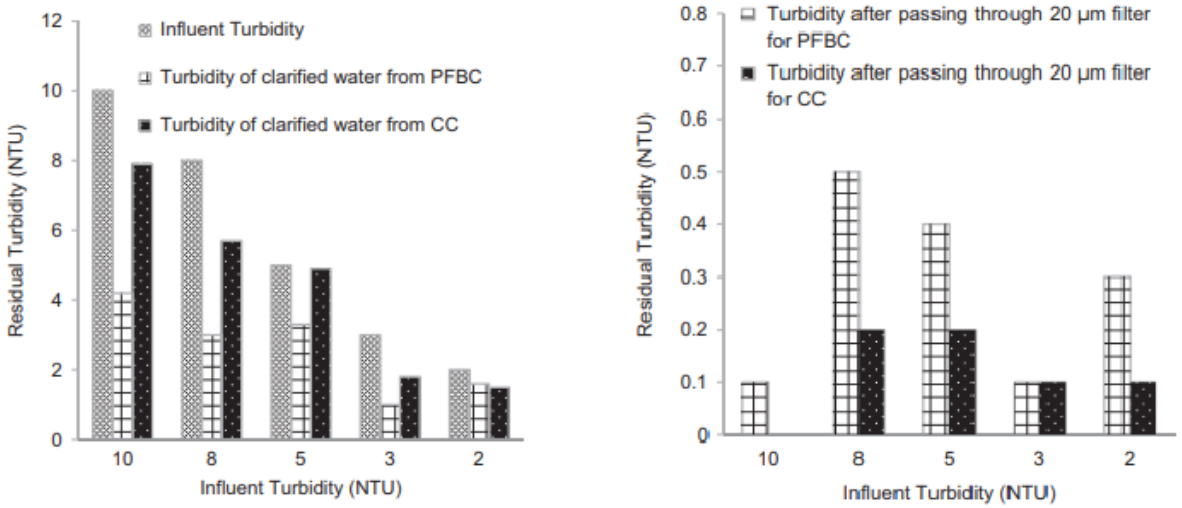
COT	CC	CML	In Test (JT)
0	50 a 76%	20 a 76%	- DC 30% less efficient than JT - CML 39% less efficient than JT
2	46-77%	22-66%	
4	48-71%	31-65%,	
6	43-84%	43-81%	
8	51-79%	57–77%;	
10	54-81%	42–75%	

Residual turbidity ranged from 2.32 to 8 NTU and 2.13 to 8.63 NTU for CC and CML, respectively. In the case of CC, the sludge is collected at the bottom and remains undisturbed. However, in the case of CML, the blanket expands and contracts at intervals. It is possible that the pulsed flow of water is not evenly distributed throughout the cross-sectional area of the blanket which can cause differential flow of water through narrow channels in the blanket while increasing the upward flow velocity in that particular area during expansion. This could be a possible reason for marginally higher residual turbidity in CML than CC.

The results of Srivastava's research; Brighu; Gupta, (2020) (Figure 3) for turbidity removal show that the CML was more efficient in the face of the lowest turbidity residuals. Another interesting point in his research was the post-filtration analysis in a 20um filter (Figure 3), observing that the CC technology presented lower turbidity values and, therefore, the water clarified with particles > 20um in its majority, thus favoring greater retention in the filtration stage.

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Figure 3 – Residual turbidity after clarification (a) and after additional filtration (b)



TOC and COD Removal

The percentage of OCD removal increased as incoming OCD increased, and then stagnated as incoming OCD increased for all three systems (Figure 4).

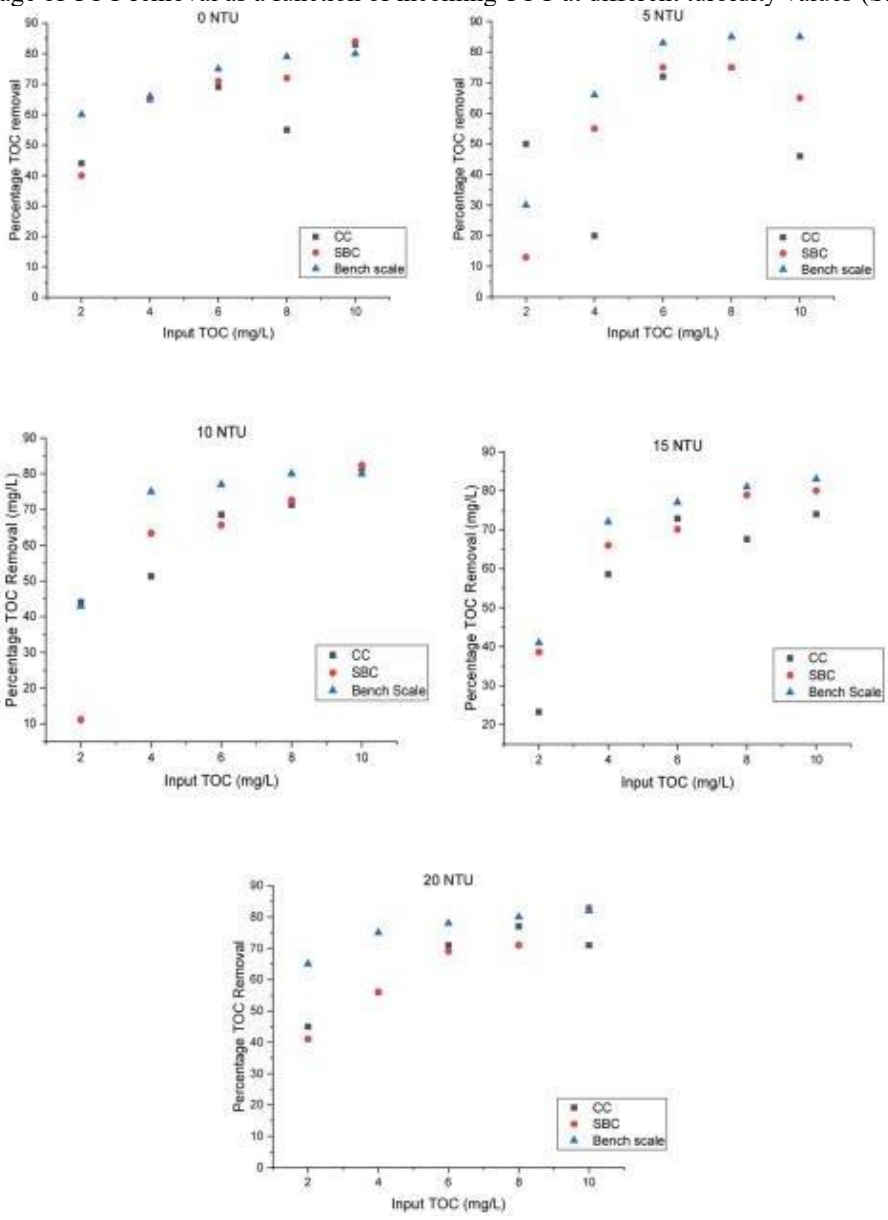
Table 3 - TOC removal percentages as a function of the variation in incoming TOC.

TOC	CC	CML	In Test
2	23-50%	11-41%	- DC 11% less efficient than JT - CML 9% less efficient than JT
4	20-65%	55-66%	
6	69-73%	66-75%	
8	55-77%	71–79%;	
10	46-83%	65-84%	

Only at low TOC intake of 2 mg/L, CC had better performance. For higher OCD concentrations, CML performed better. Overall, the percentage of TOC removal for pilot-scale reactors was lower than for bench-scale system. Residual OCD ranged from 1.01 to 5.36 mg/L for CC and 1.21 to 3.53 mg/L for CML.

DOC removal did not show any particular trend with increased TOC input or turbidity. Removal to the bench scale system, CC, and CML was 30–89%, 27–87%, and 38–92%, respectively. The residual DOC for bench scale, CC, and CML ranged from 0.5 to 1.4, 0.46-4.39, and 0.43 to 3.24 mg/L, respectively. The removal of DOC has been improved in CML than the other two systems. This improvement in DOC removal was seen in lower entry COTs that can be attributed to the increased collision rate in CML.

Figure 4 - Percentage of TOC removal as a function of incoming TOC at different turbidity values (Saxena et al, 2020).



UV254 Removal

The UV 254 portion of the DOC is understood to be the macromolecular hydrophobic portion, composed mainly of organic aromatic compounds. Intensified coagulation has been reported to act on both NOM fractions (hydrophobic and hydrophilic) when pH is optimized and removal occurs predominantly by load neutralization and lower by sweep coagulation (SAXENA; BRIGHU; CHOUDHARY, 2020). In the research presented by saxena; Brighu; Choudhary (2020), the pH was alkaline and therefore the removal of hydrophobes may have been favored at high pH and the dominant mechanism may be adsorption and coagulation by sweep.

UV254 removal increased with the increase in input TOC for both processes (Table 4).

Table 4 – UV254 removal as a function of the incoming TOC.

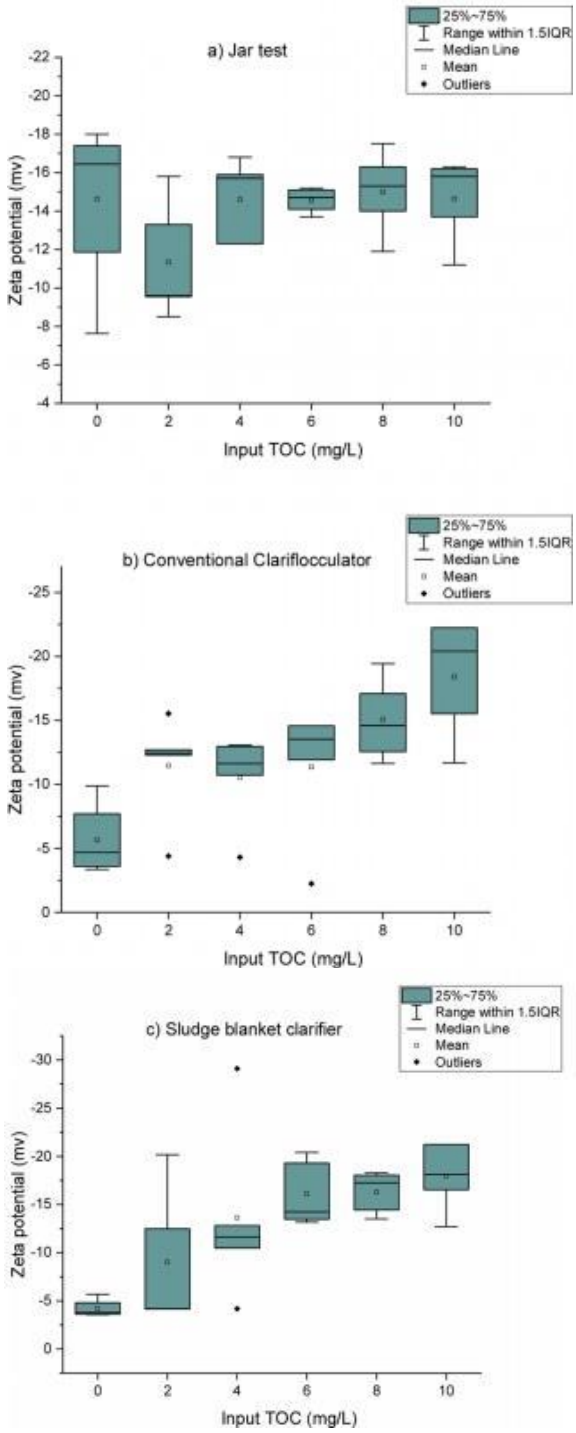
Input COT	CC	CML	In Test
2	72-80%	75-80%	- DC 8% less efficient than JT - CML 7% less efficient than JT
4	80-82%	79-85%	
6	86-89%	79-91%	
8	79-88%	86-89%;	
10	82-89%	77-90%	

Zeta potential

Zeta potential measurement is important to the coagulation process as it is indicative of the surface potential of the colloidal system and can be used effectively to measure changes in impurity load in water or coagulation destabilization efficiency (SAXENA; BRIGHU; CHOUDHARY, 2020). The Zeta potential also provides insights into prevalent mechanisms. After coagulation, the zeta potential of the jar, CC and CML tests ranged from −7.63 to −18.00, −3.36 to −22.23 mV and −3.57 to −21.23 mV, respectively.

In the case of the jar test, the zeta potential is quite similar with the increase in the input TOC. However, it can be seen that the zeta potential is more negative for the samples with high TOC input for both pilot plants (Figure 5). This indicates that the effect of the concentration of the incoming particle is more pronounced in the case of pilot plants. At lower particle concentration, the charge neutralization mechanism was dominant and resulted in a decrease in the negative charge of impurities. However, no full load neutralization was observed. The charge neutralization mechanism is known to occur at low colloidal concentrations and low coagulant doses. As TOC input increased, the load neutralization mechanism decreased, as evidenced by the higher negative zeta potential of the treated water, denoting other mechanisms involved.

Figure 5- Zeta potential after treatment for (a) Jar test, (b) CC and (c) CML;



REACTION MECHANISMS

The removal mechanisms in the coagulation and flocculation process may depend on pH/alkalinity, type of impurities (hydrophobic/hydrophilic colloids), particle concentration (high or

low turbidity or TOC), type of coagulant (conventional/pre-polymerized) and its dose. A number of mechanisms are at play simultaneously in a system. The aggregation mechanisms through which particles are removed are essentially a combination of charge neutralization, trapping

In a study by Saxena; Brighu; Choudhary (2020), the impurities were mainly hydrophobic inorganic turbidity, hydrophobic organic matter, and hydrophilic organic matter. The pH was alkaline and the coagulant used was pre-polymerized PACl with relatively stable speciation when compared to conventional coagulants, which is not impacted by variable pH conditions.

The mechanisms of removal of organic and inorganic impurities were studied using four isotherms by linear as well as nonlinear modeling: Langmuir, Freundlich, Temkin and BET isotherms. Determination coefficient R2 closer to 1 and lower RSME (Root Mean Square Error) were used to evaluate the best fit, linear and nonlinear, respectively.

According to Saxena; Brighu; Choudhary (2020), the mechanisms for the bench-scale studies were a combination of charge neutralization, adsorption, and entanglement and the isotherms followed the BET model, which is a multilayer model physical adsorption.

In this study, there are two types of pilot plants, which differ in flocculation mode. In the case of the conventional clarichlorinator, the aggregation happens by mechanical slow mixing by a rotary impeller and in the sludge blanket clarifier the aggregation happens by hydraulic mixing.

The CML at 0-15 UT turbidity fit the BET model, predominantly physical and multilayer NOM adsorption initially; CML at 20 UM fitted the Temkin model, as turbidity increases the adsorbate-adsorbate interactions become dominant indicated by the Temkin model, causing impurity trapping; In the case of a sludge blanket clarifier, there is a high solids concentration rate in the mat at higher turbidity promoting contact opportunities significantly between the particles.

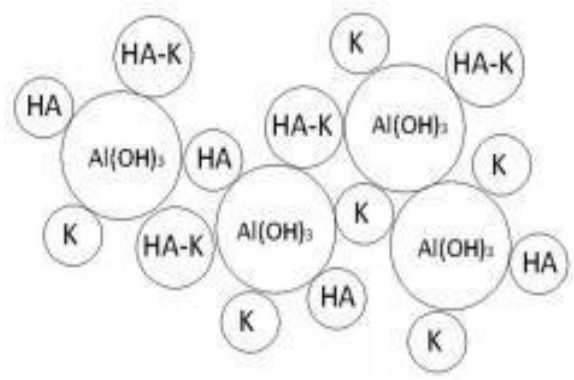
According to Srivastava; Brighu; Gupta (2020), the flake contraction and expansion blanket in a CML provides a fluidized zone of high concentration of solids treatment, which stimulates nucleation, providing surface sites, increases the flake detention time, and excess of Al species may occur, thus reducing the effect of load neutralization by Alb or Ala species and promoting adsorption and entanglement in the growing precipitate in CML. These individual allied/combined processes can help in reducing the turbidity of clarified water.

For CC, the values of R2 <0.9 and were not as high as CML, indicating the prevalence of some other mechanisms that may be load neutralization or complexation by preformed Alb species. The CC RMSE values were lower in the case of the Langmuir model for 5, 10 and 15 NTU, indicating physical and chemical adsorption in monolayer. At 20 NTU, the RMSE was the lowest for the Freundlich model, indicating multilayer physical and chemical adsorption. The prevalence of chemical adsorption indicates the dominance of load neutralization in CC, unlike CML. It is also interesting to note here that more residual DOC was found in the case of CC and the withdrawal of

DOC was better in the case of CML. The prevalence of load neutralization in CC can result in the formation of soluble complexes that could not be established and result in high DOC in CC.

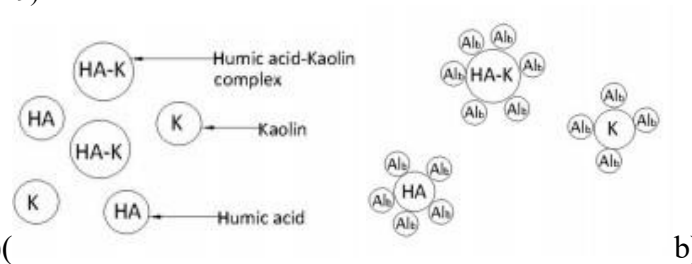
In general, for hydrophobic colloids at alkaline pH, the mechanism may be adsorption followed by entanglement of impurities in the rising precipitate. As the precipitate is formed, it is first adsorbed on the impurities by the Vander Waal forces causing charge neutralization which is also known as the NCP (precipitation load neutralization) mechanism and as the precipitate continues to grow the presence of $Al(OH)_3$ species can cause the entrapment of particulate colloids, both organic and inorganic (Figure 6). Not only that, the presence of $Al(OH)_4^-$ at alkaline pH can cause bridging between two positive spots of the coagulant absorbed in the impurities.

Figure 6 – Adsorption and entanglement mechanisms favored by the NCP process (SAXENA; BRIGHU; CHOUDHARY, 2019).



At the same time, the removal of dissolved or hydrophilic species can occur by the PNC (precipitation by load neutralization) model. The role of electrostatic forces is vital for the removal of hydrophilic colloids as the physical forces of attraction or the Vander Waal forces may not be effective in coagulating such impurities. It was observed that at low TOC input, DOC removal was better, resulting in lower DOC residual and lower negative zeta potential . The presence of Al b species may be responsible for complexing and neutralizing hydrophilic impurities and then causing them to co-precipitate (Figure 7). This precipitate can form a bridge with the other, which can be explained by the electrostatic coagulation model in which the positive part of coagulant adsorbed on one particle can interact with the exposed negative surface of the other particle.

Figure 7 – Complexation interactions between impurities (a) and neutralization of Al charges with impurities (SAXENA; BRIGHU; CHOUDHARY, 2019).



(a)(b)

In summary, the removal mechanisms in a sludge blanket clarifier could be essentially tangle of impurities in the dense sludge blanket with higher prevalence of the NCP model. For CC, the adsorption of Al(OH)3 amorphous precipitate and gradual growth precipitate, i.e., initial PNC and then NCP, to favor the entanglement of impurities could be the removal mechanism.

REMOVAL OF MICROCONTAMINANTS – DICLOFENAC – MECHANISMS

Lima et al., (2014) evaluated the removal of some drugs, including diclofenac, by the clarification process (coagulation, flocculation and sedimentation). The process was carried out on a bench scale using a jar test with characteristics presented in Figure 8. The presence in two types of waters, with higher and lower turbidity, and two different coagulants, polyaluminum chloride ((Aln(OH)mCl3 - PAC) and aluminum sulfate (SA) (Figures 9 and 10) were also evaluated. The results showed low diclofenac removals, with an average of 9% and 7% for PAC and SA, respectively.

Figure 8 - Conditions of the clarification used.

Coagulação		Floculação		Sedimentação
Tempo de mistura rápida (s)	Gradiente de mistura rápida (s^{-1})	Tempo de floculação (min)	Gradiente de floculação (s^{-1})	Velocidade de sedimentação (cm/min)
15	600 ± 20	20	35 ± 5	2,0

Figure 9 - Optimal clarification conditions for Type I water

Condições otimizadas de coagulação, floculação e sedimentação para a Água Tipo I (Turbidez inicial: 193,4 ± 15,6 uT)

Coagulante	Dose (mg/L)	pH de coagulação	Tempo de floculação (min)	Tempo de sedimentação (min)	Turbidez remanescente (uT)
SA	38	7,1 ± 0,2	20	3,5	1,40 ± 0,61
PAC	35	7,3 ± 0,3	5		1,11 ± 0,50

Figure 10 - Optimal clarification conditions for Type II water

Condições otimizadas de coagulação, floculação e sedimentação para a Água Tipo II (Turbidez inicial: 10,4 ± 0,3 uT)

Coagulante	Dose (mg/L)	pH de coagulação	Tempo de floculação (min)	Tempo de sedimentação (min)	Turbidez remanescente (uT)
SA	15	7,4± 0,3	15	3,5	2,48 ± 0,45
PAC	4	7,1 ± 0,2	10		1,17 ± 0,39

The higher percentage of removal with the use of PAC can be explained by the mechanism of floc formation. The formations of positive species are responsible for promoting the destabilization of the particles, ensuring the formation of flocs and, in the case of the use of SA, in general, they form Al(OH)2 +; Al(OH)2+; Al2(OH)2 4+; Al3(OH)2 5+ and Al13O4(OH)24 7+ (or "Al13")

However, these authors state that polyaluminum chloride already contains highly charged positive species, such as "Al13", in high concentration in the form of salt. Thus, its dependence on hydrolysis reactions is not characterized, its dissociation in water is sufficient. They also state that in the presence of CAP, the velocity and size of the flakes are greater than those observed when using SA.

According to Lima et al, (2014), the processes of removal of microcontaminants may be linked to the adsorption mechanism in the formed flakes. If the predominant removal mechanism is adsorption, it is possible that it is due to chemical interactions for most of the microcontaminants studied. The basis of this hypothesis can be supported by analyzing the zero load point (PCZ) values of the sludge generated by both coagulants. The PCZ values of the generated sludge (PCZ = 7.90 for PAC and PCZ = 7.75 for SA) were higher than the coagulation pH, indicating that the surface loads of the sludge flakes under the working conditions were slightly positive.

As the pka 4,15, DCF is lower than the coagulation pH, indicating that it has an acidic character and is in the deprotonated form, that is, they have a negative charge in solution. Such behavior strengthens the hypothesis of electrostatic interactions between the sludge generated in the clarification stage. However, DCF has only one acidic hydrogen, with pKa1 = 4.15, which gives it only a negative charge on the coagulation pH, which disfavors effective removal.

In another research conducted by Huang et al., (2019), the clarification step was also evaluated on a bench scale in the removal of diclofenac in water with pH 7.4. The amount of coagulant alum and reduction of turbidity were evaluated. The maximum total removal of residual turbidity occurred at an alum dosage of 60 mg/L, when the removal efficiency of the DCF compounds was 18.5%, in contrast to a 27% reduction in UV 254 and a 17% reduction in DOC.

The mechanism of removal of target compounds by coagulation has been mainly attributed to co-precipitation and adsorption. Co-precipitation allows the incorporation of soluble target compounds, especially anionic species, into an increasing phase of aluminum hydroxide by inclusion or occlusion.

Therefore, Al hydroxide flakes should be positively charged under moderately acidic to neutral conditions. How DCF exists as anions in the neutral solution. Electrostatic attraction plays an important role in the interaction between positively charged Al hydroxide flakes and anionic DCF. In addition, a certain fraction of DCF was transferred from the aqueous phase to the solid phase through

co-precipitation. It was also observed that the efficiency of removing DCF in solution increased with the increase in coagulant dosage.

The interaction between NOM and the target compounds may affect the adsorption of the contaminantates on Al hydroxide flakes. The different removal rate of residual turbidity and target compounds suggests that the target compounds were not removed with suspended solids during the coagulation-flocculation-sedimentation process by alum at the dosage of 0 to 100 mg/L. Coagulation of suspended solids results mainly from physical collisions and aggregation. However, the removal of soluble organic contaminants through coagulation depends mainly on their adsorption on Al hydroxide flakes (HUANG et al., 2019).

CONCLUSION

The solids contact unit as a sludge blanket clarifier offers a combination of processes such as mixing, flocculation, and clarification in a zone with high surface overflow rate, thereby reducing reactor size, mechanical impeller requirement, and area. The use of CMLs may be advantageous for waters with high DOC., however, for waters with low DOC and TOC and especially inorganic turbidity, conventional clarifiers may be a better choice.

Some differences were pointed out in the mechanism. CC showed a prevalence of load neutralization or complexation of Al13 species and subsequent chemical and physical adsorption in monolayer and multilayer for higher turbidity. In the CML mechanism, physical adsorption in multilayer prevailed and due to the sludge blanket, it maintains a high concentration of solid, favoring contact, providing a surface also providing entanglement.

In view of the discussions of diclofenac removal in jar test, the main mechanisms reported were co-precipitation and adsorption in flakes formed, mainly in Al hydroxide.

Thus, analyzing the mechanisms of CC and CML and DCF in jar test, it can be influenced that DCF would also have low removal in these processes responsible mainly for adsorption, due to its negative characteristics in the pH of activity and having only one ionizable site being less favored than the other molecules in the medium, in addition, The formation of precipitates and aggregation of other compounds can compete with the area required for adsorption.

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Climatic characteristics in the Serra do Sincorá Geopark, in Chapada Diamantina, in the state of Bahia, Brazil

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Welison Nascimento Meira[1], Fernanda da Silva Almeida[2] and Artur José Pires Veiga[3]

ABSTRACT

Climate studies and their elements are important, because in addition to research and weather forecasting, other sectors of the community need information about weather and climate, such as agriculture, aviation, civil defense, water resources management, navigation and the energy sector. In this sense, the present study aimed to analyze the variability of some elements of the climate of the Bahian municipalities of Andaraí, Lençóis, Mucugê and Palmeiras, the area of proposition for the creation of the Serra do Sincorá Geopark, in Chapada Diamantina, based on air temperature, rainfall and evapotranspiration in the perspective of understanding the behavior of the local climate and its possible effects in the region. For this analysis, specific time intervals were selected for each municipality, available at the National Institute of Meteorology (INMET) and Climatempo. The data were tabulated for statistical analysis of the behavior of the climate elements over the months and years, using as parameters the sum, minimum, maximum, average and the correlation between the meteorological variables, with the generation of climograms and comparative graphs. The relevance of the study lies in understanding the climatic variations of the municipalities in the proposed area of the Serra do Sincorá Geopark in relation to its climatic dimension, since the results may offer subsidies regarding environmental planning, in addition to a contribution to the local population, since there are few studies in the field of climatology in the region. With the analysis of meteorological data, it is proven that the municipalities of Andaraí, Lençóis, Mucugê and Palmeiras, due to climate factors, such as altitude, latitude and longitude, on a regional scale, influence the behavior of climate elements.

Keywords: Serra do Sincorá Geopark, Evapotranspiration, Precipitation, Air temperature.

[1] Student of the Geography Course, IC/FAPESB scholarship holder
Institution: State University of Southwest Bahia - UESB
E-mail: 201820658@uesb.edu.br
[2] Student of the Geography Course at UESB and IC/CNPQ scholarship holder
Institution: State University of Southwest Bahia - UESB
E-mail: 202210279@uesb.edu.br
[3] Geographer, Dr. in Architecture and Urbanism from the Federal University of Bahia - UFBA
Institution: State University of Southwest Bahia - UESB
Sector: Department of Geography, Academic Module
E-mail: veiga@uesb.edu.br

INTRODUCTION

The notion of time refers to the momentary state of atmospheric conditions at a given time and place. Climate, on the other hand, is the average study of time, in a habitual succession of times. Thus, climate is a set of atmospheric characteristics and dynamics of a certain region, analyzed over a period. For Ayoade (1996), the study of weather and climate occupies a position of fundamental importance in the broad field of environmental sciences, given that atmospheric processes influence processes in other parts of the environment, especially in the biosphere, hydrosphere and lithosphere.

Climate analysis is crucial to determine the environmental conditions in a region, directly influencing the characteristics of vegetation, fauna, and human activities. In this sense, to understand the climate of a specific area, it is important to know its factors and elements that describe meteorological conditions in quantitative terms and that can be simple, such as temperature and precipitation, or complex such as aridity and continentality. The study of climatic elements is essential for weather forecasting, for the planning of agricultural activities, environmental conservation, and the development of strategies to adapt to climate change.

Almeida (2016) points out that the climate of a region is characterized by the rhythm of seasonal variations in meteorological systems, such as temperature, rainfall and wind. The World Meteorological Organization (WMO) has set a minimum period of 30 years to define the climate based on statistical principles of central tendency measures. In the meantime, Almeida (2016) also points out that monthly or annual averages are always associated with standard deviations from the mean, which means that observations can oscillate in relation to the expected value, equivalent to the value of the standard deviation.

Climatic factors, whether natural or human, can influence and alter the climate at different scales of time and space. In this bias, the climate and its variability are the result of factors external and internal to the climate system. As listed by Andrade and Basch (2012), climate forcings can be external (variations in the Earth's orbit, solar activity, and volcanic eruptions), internal (variations in surface albedo and atmospheric composition, sea currents, latitude, and altitude), or induced by human activity.

With regard to the elements of climate, Torres and Machado (2008) define air humidity as the amount of water vapor in the atmosphere, resulting from the evaporation of water from land and water surfaces, as well as the evapotranspiration of animals and plants. They complement by stating that to produce the evaporation of water it is necessary heat and available water and, in places with sufficient heat, such as a desert, but without water to be evaporated, the humidity of the air remains low. It is worth noting that absolute humidity is the way to express the concentration of water vapor in the air and is defined as the mass of water vapor present in the unit of air volume, represented in g/m^3.

Evapotranspiration, an important element for the analysis of climatic characteristics, is the loss of water, in a gaseous state, to the atmosphere - the association of evaporation and transpiration transforms the water on the surface of planet Earth into vapor. In this perspective, Ayoade points out that:

> Evapotranspiration is the process by which moisture, in its liquid or solid form, passes into gaseous form. A distinction is generally made between evaporation and evapotranspiration. The former term is used to describe the loss of water from water surfaces or bare soil, while the latter is used to describe the loss of water from vegetated surfaces, where transpiration is of fundamental importance. In other words, evaporation is a combined process of evaporation and transpiration (Ayoade, 1996, p.129).

Precipitation happens when any liquid or frozen water forms in the Earth's atmosphere and falls back to Earth, being manifested in various ways, such as rain, hail, snow and dew. Human beings depend on precipitation for fresh water, as rainwater feeds the headwaters of rivers and fills water reservoirs. With regard to precipitation, Andrade and Basch argue that:

> Precipitation is any particle of water, solid or liquid that falls from the atmosphere and reaches the ground, from the clouds and occurs when the droplets of the clouds grow until they reach enough dimensions to fall by the effect of gravity. Precipitation is a fundamental vector of the hydrological cycle, uniting the atmosphere to the other subsystems of the climate system. [...] Precipitation is a central climatic (or meteorological) element in the variation of the weather and in the characterization of the climate of a given place (Andrade and Basch, 2012, p.25).

Regarding the climate of the Brazilian Northeast, Nimer (1989) shows that the dry character results from this region being throughout the year under the domination of the Atlantic center of action, represented by the Atlantic equatorial mass (mEa). Thus, the dry climate of the Brazilian Northeast does not originate from the contact of air masses with non-coinciding rainfall regimes during the year, as has become traditional to say. It reinforces that: "[...] Such contact regions, contrary to what some say, generally have well-distributed rainfall."

In this way, studies on climate and its elements play a fundamental role not only in weather research and forecasting, but also in various sectors of society, such as agriculture, aviation, civil defense, water resources management, navigation, and energy. In this context, this study aims to analyze the variability of some climatic elements in the municipalities of Andaraí, Lençóis, Mucugê and Palmeiras, a region where the creation of the Serra do Sincorá Geopark, in Chapada Diamantina, is proposed. For this, air temperature, rainfall, evapotranspiration and precipitation were investigated, in order to understand the behavior of the local climate and its potential impacts in the region.

In the considerations of UNESCO (United Nations Educational, Scientific and Cultural Organization), the creation of Geoparks empowers local communities, providing opportunities to generate cohesive partnerships, with the mission of articulating the processes, characteristics and periods relevant to the area, such as historical themes related to its striking geological beauty.

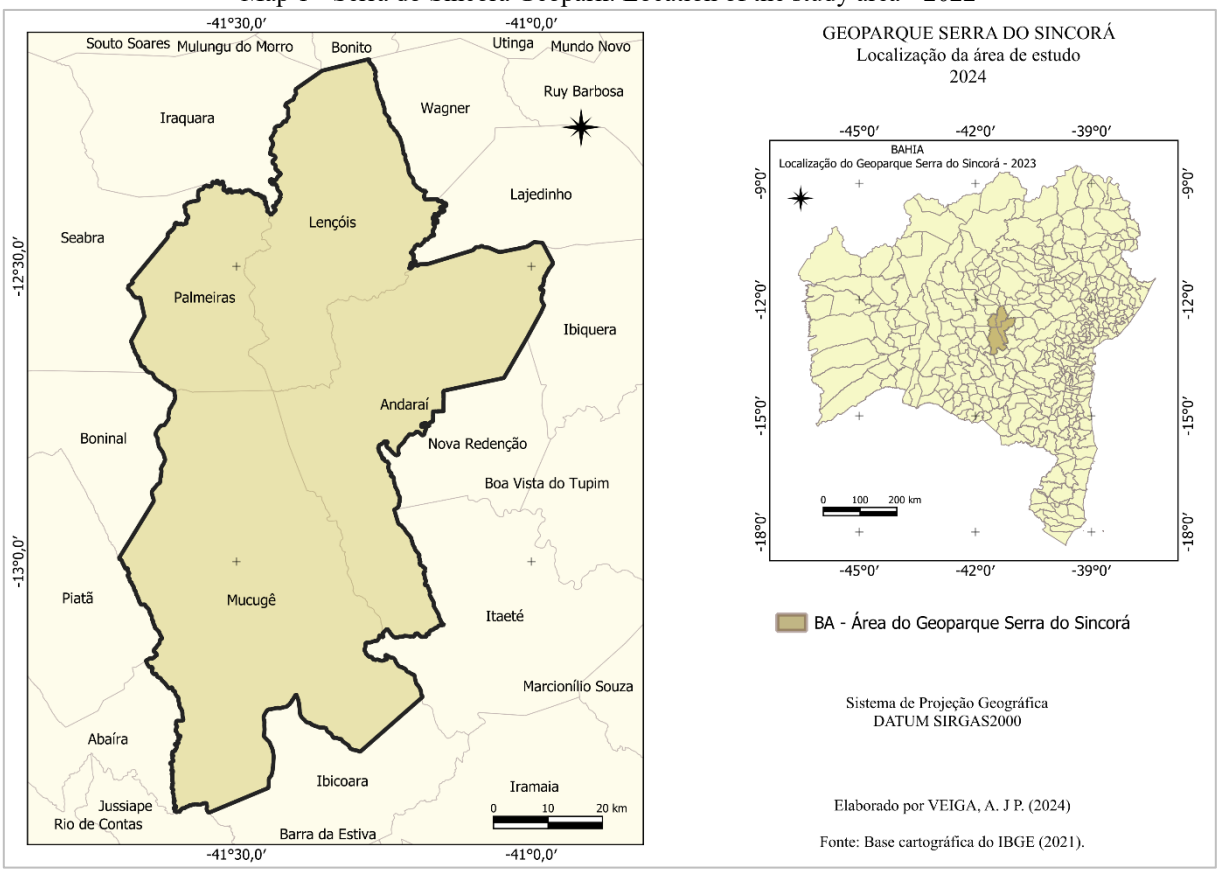
Brilha (2012) emphasizes that geological heritage, marked by unique components of geodiversity, is a natural environment without renewal. Although the geoparks lack a systematized survey with precise evaluation, it is certain that those that are in operation are managing to preserve and signify the richness of their diversity. In view of this, geoparks have been helping in the correct use of geological and natural heritage and, consequently, in the maintenance of their resources and territory.

The importance of this study lies in the understanding of the climatic variations of the municipalities covered by the area where the creation of the Serra do Sincorá Geopark is being proposed. The results obtained provide essential subsidies for environmental planning, contribute to the scientific knowledge base and support the creation of the aforementioned geopark, whose proposal will be submitted to UNESCO. In addition, this information is of great relevance to the local and regional population, given the scarce number of climatological studies carried out in the area in question.

MATERIALS AND METHODS

The study area (Map 1) is located in the municipalities of Andaraí, Lençóis, Mucugê and Palmeiras, located in the central region of the state of Bahia, in Chapada Diamantina, more specifically in the micro-region of Seabra, where they have an enormous environmental interest, especially due to their natural potential, a rich biodiversity and geodiversity. Therefore, the creation of the Serra do Sincorá Geopark, in the polygonal that delimits these municipalities, adds to the concern with the preservation of geodiversity, through geoconservation and the rise of geotourism.

Map 1 - Serra do Sincorá Geopark: Location of the study area - 2022



Source: IBGE (2021); Prepared by the authors (2024)

It is worth emphasizing that to carry out the analysis of the listed elements, altitude (vertical distance between a point on the earth's surface and sea level), latitude (distance between a point on the earth's surface and the Equator), longitude (distance between a point on the earth's surface and the Greenwich Meridian) and the Köppen climate classifications (classification based on the rainfall index, vegetation types and temperature) and Thornthwaite and Mather (classification based on the comparison between the indices of potential evapotranspiration and typical precipitation of a given area).

Andaraí (BA) (latitude 12º 48' 26" South and longitude 41º 19' 36" West), a municipality located in the central region of the Chapada Diamantina National Park (PARNA), has a population of 13,122 inhabitants, according to 2021 estimates by the IBGE (2023). With an altitude of 448 meters, the municipality has a climate classification of Am' (tropical monsoon climate), when using the classification methodology used by Köppen, and C1dA'a' (subhumid to dry), when using the classification methodology used by Thornthwaite and Mather.

The municipality of Lençóis (BA) (latitude 13º 49' 0" South and longitude 41º 43' 0" West) surrounds the Chapada Diamantina National Park (Parna), has, according to 2020 IBGE estimates (2023), a population of 11,499 inhabitants and is located at an altitude of 457 meters. The climatic classification of the municipality is Am' (tropical monsoon climate), when using the classification

methodology used by Köppen, and C1dA'a' (subhumid to dry), C2rA'a' (humid to subhumid) and B1rB' 3a' (humid), when using the classification methodology used by Thornthwaite and Mather.

Mucugê (BA) (latitude 13º 00' 19" South and longitude 41º 22' 15" West), a municipality listed as a national heritage site by IPHAN (Institute of National Historical and Artistic Heritage), is located at an altitude of 983 meters, a population of 8,889, according to IBGE estimates (2023). The climate classification of the municipality is Am' (tropical monsoon climate), when using the classification methodology used by Köppen, and B1rB' 3a' (humid), when using the classification methodology used by Thornthwaite and Mather.

Palmeiras (BA) (latitude 12º 31' 44" South and longitude 41º 33' 32" West) is the seat municipality of the Chapada Diamantina National Park (Parna), where Morro do Pai Inácio, Vale do Pati and Cachoeira da Fumaça are located, has a population of 9,019 inhabitants, according to 2019 estimates by the IBGE (2023) and an altitude of 697 meters.

In the study, meteorological data of evapotranspiration, rainfall, precipitation and air temperature were analyzed, from the municipalities of Andaraí, Lençóis, Mucugê and Palmeiras, the specific time intervals for each location: From the Andaraí Station (latitude 12º 49' and longitude 41º 20') from 1943 to 1976, located at 386 meters of altitude; For Lençóis, data from two stations were used: Porto Station (latitude 12º 29' and longitude 41º 20') from 1943 to 1972, at an altitude of 400 meters, and Lençóis Station (latitude 12º 34' and longitude 41º 23') from 1961 to 1990, at an altitude of 439 meters; Data from the Mucugê Station (latitude 12º 59' and longitude 41º 22') between 1964 and 1983, at an altitude of 870 meters; In Palmeiras, data calculated over a series of 30 years were used.

The information was essential to understand the characteristics and climatic fluctuations of the region. The meteorological data of the municipalities of Andaraí, Lençóis and Mucugê were obtained from the National Institute of Meteorology (INMET) and are available at the Superintendence of Economic and Social Studies of the State of Bahia (SEI), while the meteorological data of the municipality of Palmeiras were obtained from the official website of the company Climatempo, headquartered in Vila Mariana, in São Paulo.

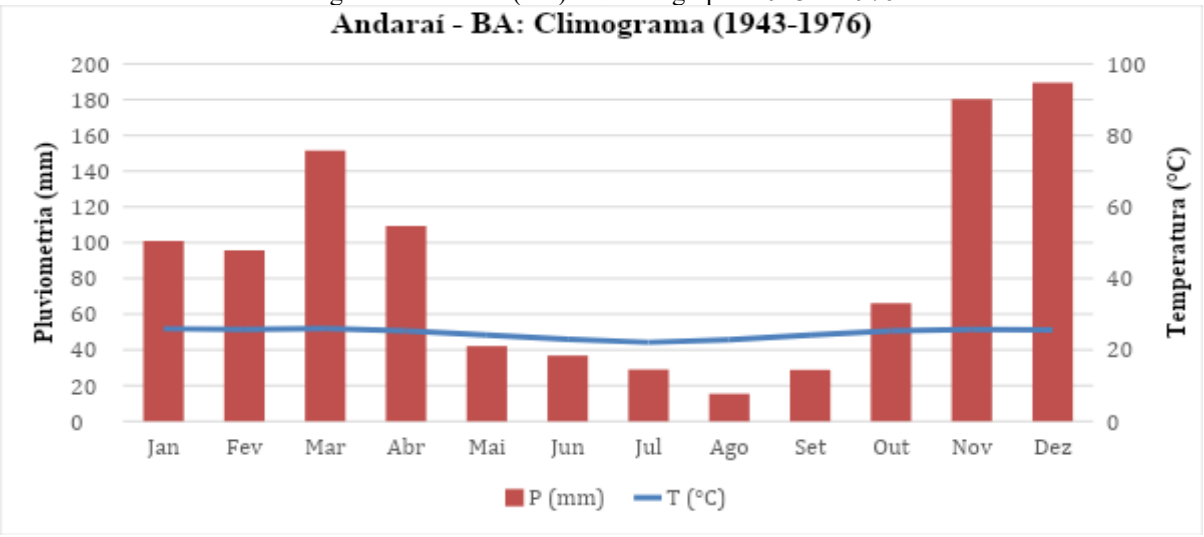
For the organization and compilation of the data, the Excel software was used. This approach was adopted in order to facilitate the understanding and presentation of the results, including statistical analyses such as the sum and monthly and annual averages, as well as the correlation between the climatic elements, with the generation of climograms and comparative graphs. Regarding the elaboration of the location map of the study area, the GIS (Geographic Information System) QGIS 3.22.11 was used, together with vector cartographic bases in shapefile format, available at the IBGE (Brazilian Institute of Geography and Statistics), from the year 2021. This tool

proved to be fundamental for an accurate and adequate visual representation of the geographic location of the municipalities.

RESULTS AND DISCUSSIONS

The municipality of Andaraí (BA) has a climate that varies from subhumid to dry, characterized by a small thermal amplitude. By analyzing the climogram (Figure 1), it is verified that the months between November and March have temperatures higher than the annual average of the period from 1943 to 1976 (24.6ºC). In these months, average temperatures ranged between 25.7ºC and 26ºC. Precipitation during this period ranged from 180.4 mm to 151.5 mm, representing the highest values compared to the months prior to November.

Figure 1 - Andaraí (BA): Climate graph - 1943 to 1976



Source: INMET (1991), SEI (1999). Prepared by the authors, 2023

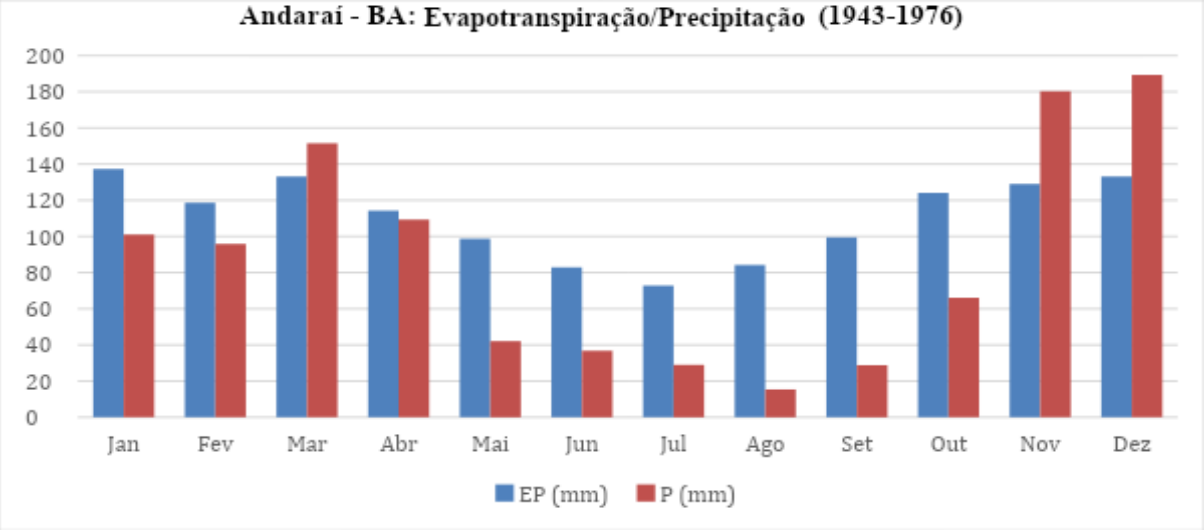
From May to September, average temperatures did not exceed 23.2ºC, characterizing them as the months with the lowest rainfall throughout the year, with only 25.9 mm recorded in September. November and December are the months with the highest rainfall, with 184.4 mm and 189.4 mm, respectively, while average temperatures ranged between 25.7 and 2.6ºC.

The months with lower rainfall coincide with the lowest temperatures during the winter period, indicating a season of low rainfall in the region, with 5 dry months. The gradual increase in the amount of rainfall begins in November and continues to increase until March. Thus, the most intense rainfall occurs during the summer, revealing the local dynamics of the distribution, variation and intensity of precipitation.

In the analysis of the relationship between precipitation and evapotranspiration in the municipality of Andaraí (Figure 2), it was observed that the months with the lowest monthly averages of evapotranspiration in the period from 1943 to 1976 ranged from 98.7 mm to 99.4 mm,

and that they coincide with the lowest monthly averages of precipitation, ranging from 15.4 mm to 42.1 mm, occurring from May to September. On the other hand, the months with the highest average evapotranspiration, ranging from 124.0 mm to 133.2 mm, are October, November, December, January, February and March, due to the increase in air temperatures during this period.

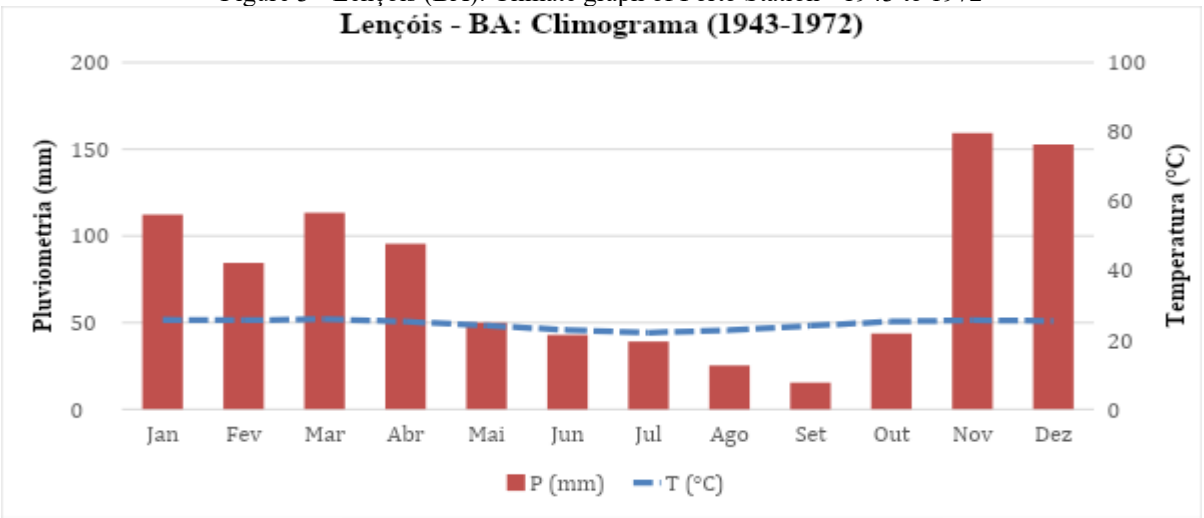
Figure 2 - Andaraí (BA): monthly averages of evapotranspiration and precipitation - 1943 to 1976



Source: INMET (1991), SEI (1999). Prepared by the authors, 2023

In the municipality of Lençóis (BA), at the Porto Station, the climatic typology varies from subhumid to dry, where it was possible to observe in the climogram (Figure 3), from 1943 to 1972, the variations in temperatures and precipitation. The months of November to March have temperatures higher than the annual monthly average of 24.6ºC, in the period 1943-1972, with annual monthly averages ranging from 25.7ºC to 26ºC. During this period, precipitation varied from 159.4 mm to 113.2 mm, these being the months with the highest values compared to the months of May to October, which have averages between 15.4 mm and 49.9 mm, presenting 6 dry months.

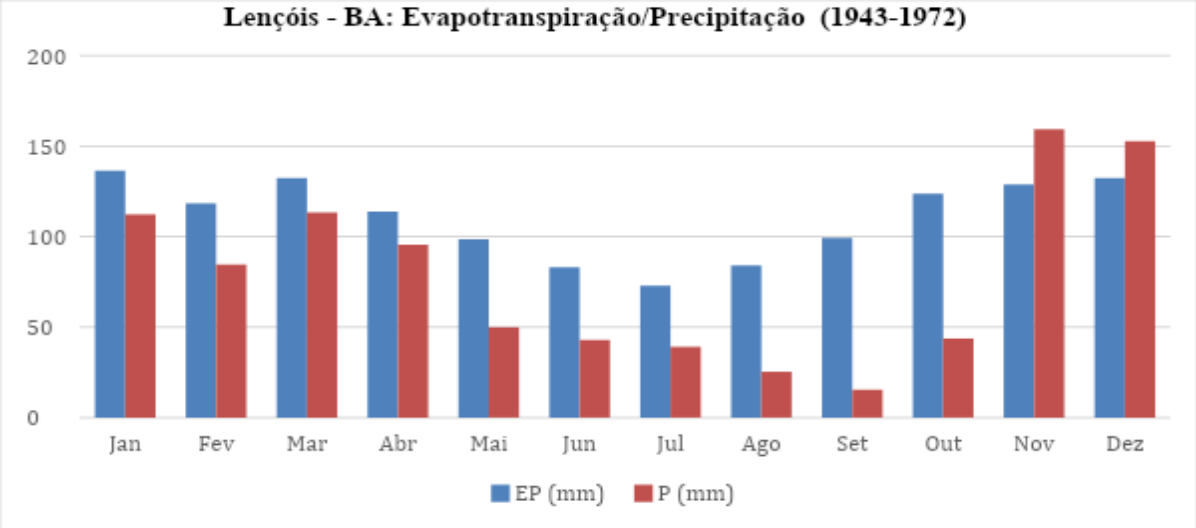
Figure 3 - Lençóis (BA): Climate graph of Porto Station - 1943 to 1972



Source: INMET (1991), SEI (1999). Prepared by the authors, 2023

In the correlation between precipitation and evapotranspiration of Lençóis, from Porto Station (Figure 4), it was evident that the months with the lowest evapotranspiration occurred from May to September, with an average of 87.56 mm, in contrast to the months from October to April, which had an average evapotranspiration of 126.5 mm.

Figure 4 - Lençóis (BA): Evapotranspiration and precipitation of Porto Station - 1943 to 1972

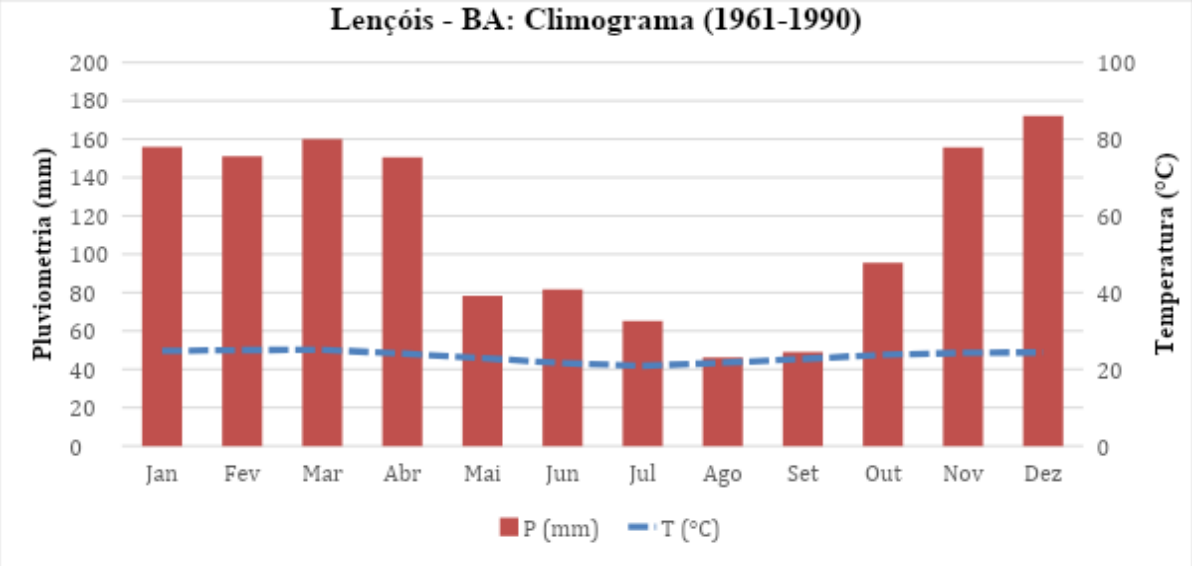


Source: INMET (1991), SEI (1999). Prepared by the authors, 2023

The values of the lowest evapotranspiration coincide with the lowest rainfall, with an average of 34.52 mm and occurring in the months of May to September, in contrast to the average precipitation in the months of October to April, of 108.7 mm.

When analyzing the climogram of the municipality of Lençóis, from the Lençóis Station, from the period between 1961 and 1990 (Figure 5), it was observed that the months of November to March recorded the highest temperatures, with an annual average of 24.7°C. In contrast, the months of May to October had an average of 22.2°C. During the interval from November to March, precipitation ranged from 172.1 to 160.2 mm, indicating a more intense rainy season in these months compared to the months prior to November, in which precipitation fluctuated between 150.5 mm and 46.3 mm, with only 2 dry months.

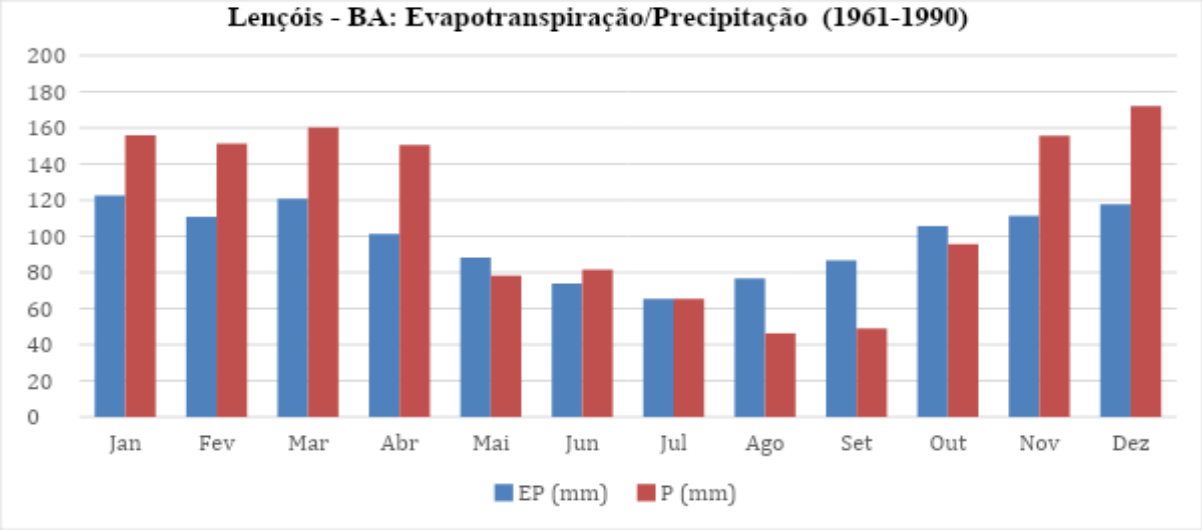
Figure 5 - Lençóis (BA): Climate graph by Climatic of Lençóis Station - 1961 to 1990



Source: INMET (1991), SEI (1999). Prepared by the authors, 2023

In the relationship between the amount of rainfall and the evapotranspiration of Lençóis, from the Lençóis Station, from 1961 to 1990 (Figure 6), it is noted that the months with the lowest evapotranspiration coincide with the periods of lower precipitation, occurring from May to September, with evapotranspiration values ranging from 65.4 mm to 88.2 mm, and precipitation ranging from 46.3 mm to 81.6 mm. On the other hand, the months of October to March have evapotranspiration rates between 105.7 mm and 122.6 mm, and precipitation rates between 95.6 mm and 172.1 mm.

Figure 6 - Lençóis (BA): Evapotranspiration and precipitation of the Lençóis Station - 1961 to 1990



Source: INMET (1991), SEI (1999). Prepared by the authors, 2023

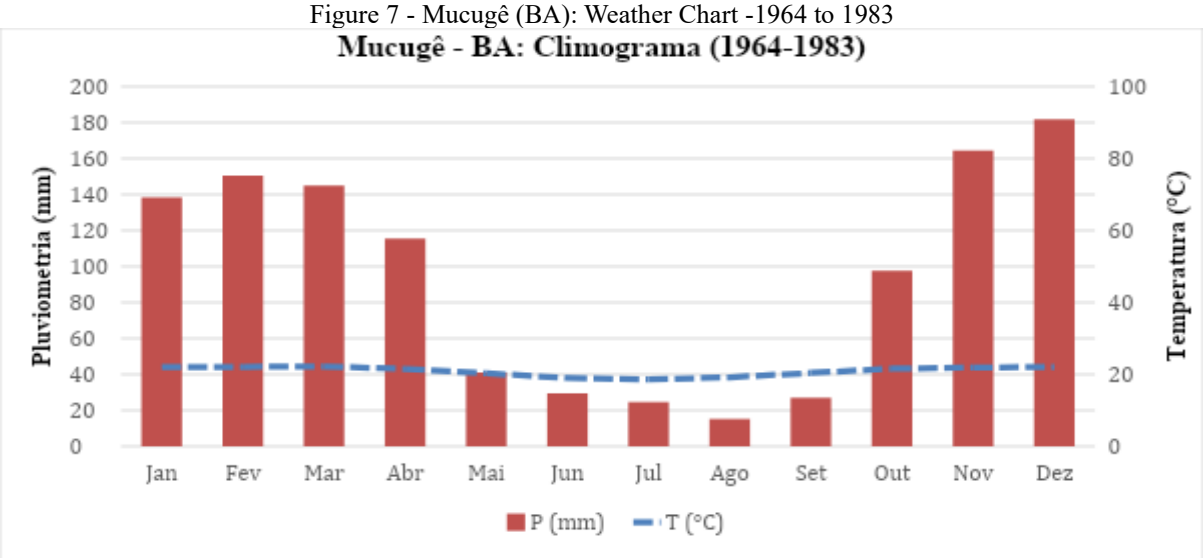
The municipality of Mucugê has a climate typology that varies from humid, subhumid to dry. In the climatogram (Figure 7), the highest average temperature was observed in December, with 22.1ºC, compared to the annual average of 20.9ºC, accompanied by a precipitation of 181.7 mm. In

the months of May to September, average temperatures remained below 20.5ºC, these being the months with the lowest rainfall throughout the year, with only 15.2 mm of rain in August, thus standing out below the annual monthly average of 94.1 mm. November and December are the months that record the highest rainfall, above the annual average of 94.1 mm, with 164.4 mm and 181.7 mm, respectively, while average temperatures vary between 21.9ºC and 22.1ºC, presenting 5 dry months.

In the correlation of the data from Mucugê, it was observed that during the winter, they were the months with the lowest precipitation and lowest temperatures, whose rainfall indices varied from 29.5 mm to 15.2 mm, between June and September, being below the annual average of 94.1 mm, while temperatures oscillate between 19.4ºC and 20.4ºC, below the average of 20.9ºC.

From November onwards, precipitation gradually increased, reaching its peak in the summer months, from December to March, with temperatures between 22.1ºC and 22.2ºC and rainfall from 181.7 mm to 145 mm. This dynamic reveals the distribution, variation and intensity of precipitation throughout the year, with the months of November and December being the wettest, characterized as rainfall during the summer. These seasonal weather patterns are distinctive features of the region.

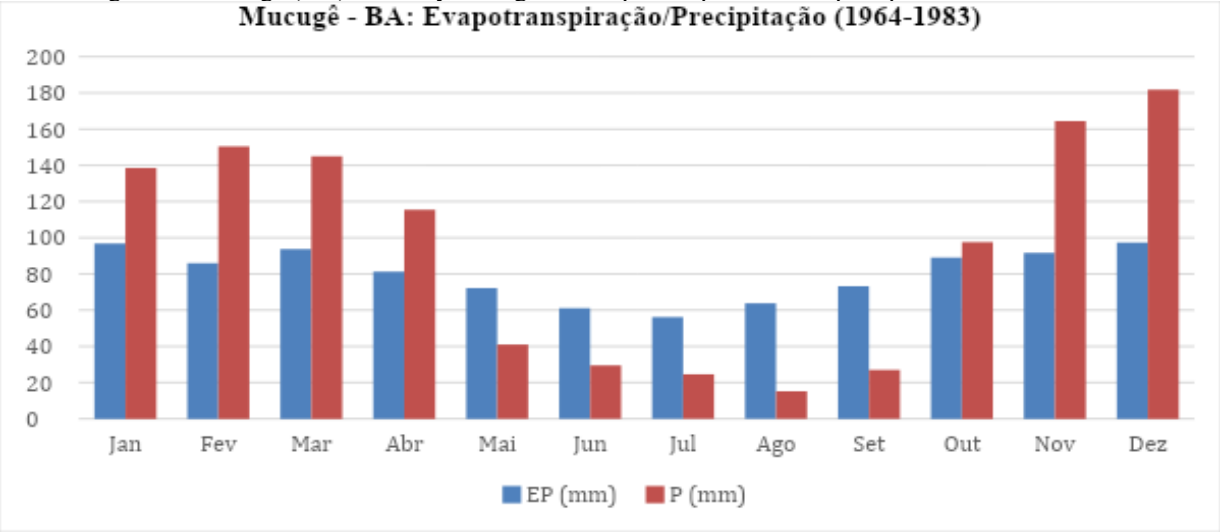
Figure 7 - Mucugê (BA): Weather Chart -1964 to 1983



Source: INMET (1991), SEI (1999). Prepared by the authors, 2023

In the relationship between precipitation and evapotranspiration in the municipality of Mucugê (Figure 8), it is noted that the months with the lowest evapotranspiration were from May to September, with averages ranging from 72.1 mm to 56.2 mm, and that they coincide with the lowest rainfall, ranging from 41 mm to 15.2 mm. This association between evapotranspiration and precipitation shows the direct influence of climatic conditions on the amount of water available in the environment.

Figure 8 - Mucugê (BA): monthly averages of evapotranspiration and precipitation - 1964 to 1983



Source: INMET (1991), SEI (1999). Prepared by the authors, 2023

In the municipality of Mucugê, during the drier months, low evapotranspiration is associated with lower temperatures and less rainfall, while in the warmer months, evapotranspiration is higher due to rising temperatures. This interaction between precipitation and evapotranspiration plays an important role in the availability of water in the ecosystem.

By analyzing the meteorological data of Palmeiras (BA), inserted in the Caatinga biome, it is found that the municipality has a climate characterized by variations between the dry subhumid, semi-arid and humid subhumid types. By analyzing the climograms, it was possible to observe that in the municipality an annual average temperature of 22.4ºC was recorded, with temperatures ranging between 29ºC and 15ºC. About precipitation, there was a variation throughout the year, with values from 117 mm in December to 24 mm in July. This oscillation in the amount of rain over the months directly influences the availability of water in the region, with impacts on agricultural activities, vegetation, the region's ecosystem, and the lives of the regional population. It is important to consider this climate data when planning activities and making decisions related to environmental and agricultural management.

CONCLUSION

The municipalities of Andaraí, Lençóis, Mucugê and Palmeiras have a mild climate, with average monthly/annual temperatures ranging from 20.9 to 24.6ºC. As for rainfall, there is an irregular distribution of rainfall throughout the year in these regions. During the months of May to August, there is a shortage of rainfall, insufficient to meet the demands of the soil, resulting in periods of drought. On the other hand, in the months of November to March, there is an excess of rainfall, contributing to a greater water supply.

The Serra do Sicnorá Geopark is located in a region with different geomorphological, geological, pedological and environmental characteristics, whose interactions of the elements of the physical environment influence the climatic typologies of the region. Altitudes range from 300 to 1,700 meters, with air masses entering the relief with an orographic barrier, with a morphology that influences climate dynamics and macroclimate conditions. Several air masses act in the region such as the Continental Equatorial Mass (mEc), which occurs mainly in the summer and the Atlantic Tropical Mass (mTa) and the Atlantic Polar Mass (mPa), with greater intensity in the winter.

The relief of the region, with slopes and orientations, with complex gradual transitions and orographic and lithological accidents, contributed to the formation of a zone of climatic transition, favoring or reducing rainfall or aridity, with the formation of orographic rainfall in certain regions, such as that which occurs on the eastern slope of the Serra do Sincorá, in contact with arid areas, with typology ranging from humid, subhumid to dry, thus providing a rich biodiversity and geodiversity, with species adapted to edaphoclimatic conditions, which reinforces the importance of the creation of the Serra do Sincorá Geopark, for current and future generations.

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Crafting a competitive business development strategy for Java Aroma Essential: An MSME in the essential oil industry

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Jorge Figueiredo[1], Isabel Oliveira[2] and Maria Nascimento Cunha[3]

ABSTRACT

Java Aroma Essential (JAE), a Micro, Small, and Medium Enterprise (MSME) in an essential oil industry that urgently needs a robust development strategy to ensure business continuity. This study employs the Quantitative Strategic Planning Matrix (QSPM) method, gathering data through Focus Group Discussions (FGD) with both customers and company management. The Internal-External (IE) matrix places JAE in Quadrant I (Growth and Build), indicating a focus on intensive strategies such as market penetration, market development, and product development. The QSPM matrix further identifies the priority strategy as recruiting employees proficient in digital marketing

This research contributes significantly to the literature on MSME business strategy development, especially within the essential oil sector. The key recommendation is to enhance JAE's market presence by hiring digital marketing experts. Few studies provide strategic insights for MSMEs in this industry, making this paper a valuable resource that offers a comprehensive development strategy and actionable steps for implementation. While the findings are tailored to MSMEs similar to JAE, future research should investigate broader applications across diverse MSME contexts.

Keywords: Industry 4.0, SWOT, QSPM, Digital marketing, Agribusiness.

[1] Lusiada University, Economics and Business Sciences, Vila Nova de Famalicão, Portugal
E-mail: jorgefig85@gmail.com
[2] Lusiada University, Economics and Business Sciences, Vila Nova de Famalicão, Portugal
E-mail: isabel.m.m.oliveira@gmail.com
ORCID: https://orcid.org/0000-0001-5519-2044
[3] Lusofona University, Intrepid Lab, Porto, Portugal
E-mail: maria14276@gmail.com
ORCID: https://orcid.org/0000-0002-1291-231X

INTRODUCTION

The landscape of business development is evolving rapidly, particularly in response to the COVID-19 pandemic, which has accelerated the adoption of online business models. Advancements in Industry 4.0 have made modern information technology more accessible, providing crucial competitive advantages. These technological advancements enable seamless interactions between consumers and producers, significantly enhancing business sustainability (Alvarez-Meaza et al., 2020).

Java Aroma Essential (JAE), established in 2017, operates as a Micro, Small, and Medium Enterprise (MSME) in the essential oil industry, with its production facilities located in Kediri and its marketing office in Bekasi. Indonesia's crucial oil exports, including products derived from patchouli, vetiver, nutmeg, cloves, citronella, ylang-ylang, eucalyptus, sandalwood, pepper, and cinnamon, play a vital role in the country's agribusiness sector (Kurniawan et al., 2020). The quality of these essential oils is influenced by various factors, such as distillation methods and the condition of raw materials (Sari et al., 2018).

Despite being a relatively young company, JAE has exhibited promising growth, as evidenced by a significant increase in sales from May to July 2020. To maintain this growth trajectory, JAE needs an effective marketing strategy that leverages its internal strengths and capitalizes on external opportunities while mitigating threats. This study aims to formulate such a strategy through comprehensive internal and external analyses, utilizing the Quantitative Strategic Planning Matrix (QSPM) approach (Hadrian et al., 2021).

Focusing on digital marketing is essential for JAE to expand its market reach and enhance its competitive position. An online presence is crucial for business performance and competitiveness (Lorente-Páramo et al., 2021). This research seeks to identify the most effective strategies to boost JAE's market presence and ensure its long-term sustainability.

HISTORY OF JAVA AROMA ESSENTIAL (JAE)

ESTABLISHMENT AND EARLY YEARS

Java Aroma Essential (JAE) was established in 2017 in Indonesia as a Micro, Small, and Medium Enterprise (MSME) focused on the essential oil industry. The company's production facilities are located in Kediri, while its marketing office is situated in Bekasi. From its inception, JAE aimed to leverage Indonesia's rich resources in essential oils, which are known for their high quality and diverse applications (Alvarez-Meaza et al. 2020)

INITIAL CHALLENGES AND GROWTH:

Despite being a relatively young company, JAE faced numerous challenges typical for MSMEs, including limited resources, market competition, and the need for a robust marketing strategy. However, the company quickly gained traction due to the rising demand for essential oils driven by lifestyle changes and an increasing focus on natural and organic products. The COVID-19 pandemic further accelerated the shift towards online business models, which JAE adapted to by enhancing its digital marketing efforts.

STRATEGIC DEVELOPMENTS

JAE's growth strategy involved a comprehensive analysis of its internal strengths and external opportunities. The company utilized strategic tools such as the Quantitative Strategic Planning Matrix (QSPM) and the SWOT analysis to identify key areas for improvement and expansion. This approach highlighted the importance of digital marketing and the need to recruit skilled employees to maximize the company's market presence (Ratnasari et al. 2019).

KEY MILESTONES

Market Penetration and Expansion: JAE focused on increasing product sales through social media promotions and endorsements by public figures. This helped in enhancing brand visibility and customer engagement (Cunha, 2019).

Reseller Network: The company expanded its reseller network across major cities in Indonesia and provided marketing training to resellers, facilitating easier sales and distribution of essential oil products.

Product Quality and Customer Relationships: Maintaining high product quality and fostering strong customer relationships became a cornerstone of JAE's business strategy, ensuring customer loyalty and satisfaction.

Digital Marketing Expertise: Recognizing the critical role of digital marketing in today's business landscape, JAE prioritized hiring experts in this field. This strategic move significantly boosted the company's sales and competitive positioning.

CURRENT STATUS AND FUTURE OUTLOOK

Today, Java Aroma Essential continues to grow, driven by a well-rounded business development strategy that leverages digital marketing, strong customer relationships, and a broad reseller network. The company is poised for sustained success in the competitive essential oil market by continually adapting to market trends and consumer preferences (David & David, 2019).

THEORETICAL BACKGROUND

Designing an effective business strategy involves three critical stages: the input stage, the matching stage, and the decision stage.

Input Stage: The input stage focuses on collecting and summarizing essential information needed for strategy formulation. This stage involves identifying internal and external factors through the creation of EFE (External Factor Evaluation) and IFE (Internal Factor Evaluation) matrices, which are crucial for enhancing MSME marketing strategies (Hidayatullah et al., 2020). The integrated design of these matrices significantly boosts business competitiveness (Pazouki et al., 2017).

Matching Stage: In the matching stage, internal strengths and weaknesses are aligned with external opportunities and threats. Techniques such as SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis and the IE (Internal-External) matrix are employed to develop viable strategic alternatives. These methods provide a comprehensive evaluation of both internal and external business factors (Wang & Wang, 2020; Astuti & Ratnawati, 2020). The objective is to determine the company's position and generate practical alternative strategies rather than identifying a single optimal solution.

Decision Stage: The final stage, the decision stage, utilizes the Quantitative Strategic Planning Matrix (QSPM) to objectively prioritize the strategic alternatives identified in the matching stage.

QSPM is a robust tool for determining the most effective business development strategies, offering a systematic approach to evaluate and rank these alternatives based on their relative attractiveness (Chandra & Kumar, 2021).

By thoroughly analyzing internal and external factors and systematically prioritizing strategies, businesses can create well-rounded and effective development plans. This structured approach ensures that all relevant aspects are considered, ultimately leading to improved strategic decision-making and enhanced business performance (Zebua & Sunaryanto, 2021).

PROBLEM STATEMENT

This study aims to comprehensively assess the internal and external environmental conditions of Java Aroma Essential (JAE) and evaluate the company’s potential to compete effectively in the market (Nugraha & Murniawaty, 2018).

The primary objective is to develop a tailored business development strategy that leverages JAE's current strengths and opportunities while addressing its weaknesses and external threats (Santoso, 2020).

RESEARCH METHODOLOGY

This quantitative research was conducted using a multi-method approach that included direct observation, interviews, and a literature review to gather comprehensive data (Nascimento Cunha et al, 2019) The process involved several key steps:

Direct Observation:
Operations: Observations were made on-site to understand JAE's operational processes, workflow, and production methods.
Financial Statements: Financial documents were reviewed to assess the company's financial health, including revenue, expenses, and profitability.
Equipment: The equipment used in production was inspected to evaluate its condition, efficiency, and contribution to product quality (Marfina et al., 2019).

Interviews:
Management Team: In-depth interviews were conducted with the Chief Director and the Sales and Marketing Manager to gain insights into the strategic direction, challenges, and opportunities perceived by the leadership.
Customers: Interviews with customers provided valuable feedback on their experiences, satisfaction levels, and perceptions of the product quality and service (Dearlove et al, 2021).

Questionnaires:
To supplement the interviews, questionnaires were distributed to both management and customers. These questionnaires were designed to assess the importance of various factors in the SWOT analysis, helping to quantify strengths, weaknesses, opportunities, and threats (Dearlove et al, 2021).

Literature Review:
Relevant literature was reviewed to provide a theoretical framework and context for the study, drawing on existing research related to MSME business strategies, essential oil industry trends, and strategic planning methods ((Nugraha & Murniawaty, 2018).

IE Matrix Construction:
The Internal Factor Analysis Summary (IFAS) and External Factor Analysis Summary (EFAS) scores were derived from the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrices, respectively. These scores were used to construct the IE matrix, which helps in categorizing the company's strategic position.
The IFE matrix focused on internal aspects, identifying strengths and weaknesses within the company.
The EFE matrix analyzed external factors, highlighting opportunities and threats in the market environment.

SWOT Matrix Development:
Using the data from the IFE and EFE matrices, a SWOT matrix was developed. This matrix provided a structured analysis of internal and external factors, enabling the identification of key strategic priorities.
The SWOT matrix served as a foundation for developing actionable strategies by matching internal capabilities with external possibilities and challenges

Through this rigorous and structured approach, the study aimed to provide a clear and detailed understanding of JAE's internal and external environments, ultimately guiding the formulation of an effective business development strategy tailored to the company's specific needs and market context.

RESULTS

IE MATRIX (INTERNAL-EXTERNAL)

The identification of factors for the Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) matrices was derived from empirical field research. Internal and external factors were determined through interviews with customers (buyers) and discussions with key management personnel, including directors and managers, who play significant roles in the sales and marketing operations of Java Aroma Essential.

Based on these interviews, the internal strengths and weaknesses of Java Aroma Essential were identified. Subsequently, the determination of weights and ratings for these factors was carried out by distributing questionnaires to respondents. The questionnaire allowed respondents to rate each IFE factor on a scale from 1 to 4, ranging from "disagree" to "strongly agree" (David & David, 2019).

The processed data from the IFE and EFE matrices, including the weight values and ratings for each internal factor attribute, are presented in Table 1. The total IFE score is 3.47, and the total EFE score is 3.41. These scores facilitate the construction of the IE matrix, as depicted in Figure 1.

Table 1: IFE-EFE Matrix

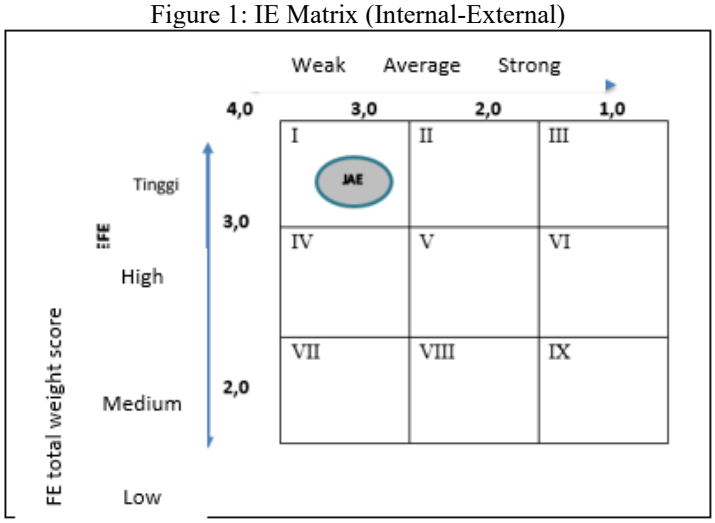
No	Strength	Quantity	Rate	Weight %	Weight x Rate
S1	The location of the marketing office is strategic.	36	3.60	0.095	0.34
S2	The quality of after-sales service is excellent.	36	3.60	0.095	0.34
S3	It has a competitive selling price and quality of essential oils that are guaranteed purity	34	3.40	0.090	0.31
S4	Many Purchase Package Promotions are offered	35	3.50	0.092	0.32
S5	Have good *reviews* from buyers.	36	3.60	0.095	0.34
S6	24-hour *customer care on-call* facility available	36	3.60	0.095	0.34
	Weakness				
W1	They haven't a permanent employee yet.	34	3.40	0.090	0.31
W2	Promotional media and online shopping are still few.	35	3.50	0.090	0.32
W3	The number of resellers and content updates is still small.	35	3.50	0.092	0.32
W4	BPOM licensing is still running.	37	3.70	0.98	0.36
W5	The volume size variant of *essential oils* is only one type.	25	2.50	0.066	0.16
TOTAL		**379**		**1.00**	**3.47**

	Opportunity	Quantity	Rate	Weight %	Weight x Rate
O1	The vast market potential of the FMCG industry in Indonesia	37	3.70	0.109	0.40
O2	The market segment in city dwellers who tend to be consumptive	35	3.50	0.103	0.36
O3	Increased activity of city dwellers and high congestion rates	34	3.40	0.100	0.34
O4	The increasing number of online shopping application users	34	3.40	0.100	0.34
O5	Indonesia's vast geographical area and the cultivation of diverse varieties of essential plants	36	3.60	0.106	0.38

	Threats				
T1	Many new competitors have sprung up for similar products	35	3.50	0.103	0.36
T2	The price of product packages at lower prices than competitors	35	3.50	0.103	0.36
T3	Creative content ads for product promotion from more competitors	29	2.90	0.086	0.25
T4	Various types of *essential oil* products are sold online.	31	3.10	0.091	0.28
T5	Lack of consumer knowledge about the benefits of the product and how to use it.	33	3.30	0.097	0.32
TOTAL		**339**		**1.00**	**3.41**

Source: Research results, 2023

Figure 1: IE Matrix (Internal-External)



Source: Research results, 2023

SWOT ANALYSIS

The SWOT matrix comprises four alternative strategies, each designed to leverage or address different combinations of internal and external factors (Kotler, 2019; Ali et al., 2021). These strategies are:

SO Strategy (Strengths - Opportunities): Leveraging the company's strengths to capitalize on external opportunities.

WO Strategy (Weaknesses - Opportunities): Addressing the company's weaknesses while taking advantage of external opportunities.

ST Strategy (Strengths - Threats): Using the company's strengths to mitigate or counteract external threats.

WT Strategy (Weaknesses - Threats): Reducing the company's weaknesses to defend against external threats.Table 2 provides a detailed overview of these four alternative strategies.

Table 2: SWOT Matrix Results

INTERNAL / EXTERNAL	STRENGTH (S)	WEAKNESSES (W)
	1. The location of the marketing office is very strategic. 2. The quality of after-sales service is excellent. 3. Has a competitive selling price and quality of essential oils that are guaranteed purity 4. Many Purchase Package Promotions are offered. 5. Have good reviews from buyers. 6. 24-hour customer care on-call facility available	1. Don't have a permanent employee yet. 2. Promotional media and online shopping are still few. 3. The number of resellers and content updates is still small. 4. BPOM licensing is still running. 5. The volume size variant of essential oils is only one type.
OPPORTUNITIES (O)	**STRATEGY (1) S-O**	**STRATEGY (2) W-O**
1. The vast market potential of the FMCG industry in Indonesia 2. The market segment in city dwellers who tend to be consumptive 3. Increased activity of city dwellers and high congestion rates 4. The increasing number of online shopping application users 5. Indonesia's vast geographical area and the cultivation of diverse varieties of essential plants	• Increase promotional activities.	• Reseller network addition.
THREATS (T)	**STRATEGY (3) S-T**	**STRATEGY (4) W-T**
1. Many new competitors have sprung up for similar products 2. The price of product packages at lower prices than competitors 3. Creative content ads for product promotion from more competitors 4. Various types of essential oil products are sold online. 5. Lack of consumer knowledge of product benefits and how to use it.	• Establish good relationships with customers.	• Recruiting employees who are experts in the field of digital marketing.

Source: Research results, 2023

QUANTITATIVE STRATEGIC PLANNING MATRIX (QSPM)

Following the input and matching stages, several alternative strategies were generated from the results of the SWOT analysis. The IFE (Internal Factor Evaluation), EFE (External Factor Evaluation), and QSPM (Quantitative Strategic Planning Matrix) are strategic tools employed to identify threats, opportunities, weaknesses, and strengths as internal and external business factors (Zulkarnain et al., 2018). Each alternative strategy is objectively assessed using the QSPM method, which evaluates the company's internal and external environmental conditions.

The QSPM method uses internal and external data to select the most effective strategy (Mallick et al., 2020). Data collection for QSPM is conducted through a rating questionnaire, where respondents assign values from 1 to 4 (not prioritized, somewhat preferred, preferred, highly

preferred) to each attribute of internal and external factors against four alternative strategies from the SWOT matrix. These alternative strategies are then analyzed in the QSPM to determine the most effective course of action (Ali et al., 2021).

Ten respondents from Java Aroma Essential MSMEs rated each alternative strategy, and the total QSPM value was calculated by multiplying the rating by the weight of each factor from the IFE and EFE matrices. Understanding consumer perception, an essential external factor, is crucial for designing business development strategies (Ratnasari et al., 2019). The alternative strategy with the highest total value is deemed the most suitable for the company's conditions. The value of each alternative strategy is detailed in Table 3. The prioritized alternative strategies, as determined by the QSPM Matrix calculation, are presented in Table 4.

Table 3: QSPM Matrix Calculation

NO	ATTRIBUTE	WEIGHT	STRATEGY 1		STRATEGY 2		STRATEGY 3		STRATEGY 4	
			AS	TAS	AS	TAS	AS	TAS	AS	TAS
	STRENGTH									
1	The location of the marketing office is very strategic.	0.095	3.60	0.34	2.70	0.26	2.60	0.25	3.40	0.32
2	The quality of after-sales service is excellent.	0.095	3.00	0.29	3.30	0.31	3.10	0.29	3.20	0.30
3	It has a competitive selling price and quality of essential oils that are guaranteed purity	0.090	2.50	0.23	3.00	0.27	3.30	0.30	3.60	0.32
4	Many Purchase Package Promotions are offered.	0.092	3.50	0.32	3.20	0.29	3.50	0.32	3.30	0.30
5	Have good *reviews* from buyers.	0.095	2.80	0.27	3.40	0.32	3.20	0.30	3.70	0.35
6	24-hour *customer care on-call* facility available	0.095	2.60	0.25	2.80	0.27	3.00	0.29	3.40	0.32
	WEAKNESS									
1	They haven’t a permanent employee yet.	0.090	2.70	0.24	2.70	0.24	3.30	0.30	3.70	0.33
2	Promotional media and online shopping are still few.	0.092	3.30	0.30	3.20	0.29	3.60	0.33	3.70	0.34
3	The number of resellers and content updates is still small.	0.092	3.20	0.29	3.40	0.31	3.10	0.29	3.30	0.30
4	BPOM licensing is still running.	0.98	3.30	0.32	3.40	0.33	3.40	0.33	3.60	0.35
5	The volume size variant of *essential oils* is only one type.	0.066	2.90	0.19	2.00	0.13	3.10	0.20	3.50	0.23
	OPPORTUNITIES									
1	The vast market potential of the FMCG industry in Indonesia	0.109	3.60	0.39	2.80	0.31	3.40	0.37	3.40	0.37
2	The market segment in city dwellers who tend to be consumptive	0.103	3.30	0.34	3.40	0.35	3.50	0.36	3.60	0.37
3	Increased activity of city dwellers and high congestion rates	0.100	2.90	0.29	2.50	0.25	3.50	0.35	2.60	0.26
4	The increasing number of online shopping application users	0.100	3.20	0.32	3.30	0.33	3.40	0.34	3.10	0.31
5	Indonesia's vast geographical area and the cultivation of diverse varieties of essential plants	0.106	3.30	0.35	3.30	0.35	3.40	0.36	3.20	0.34

NO	ATTRIBUTE	WEIGHT	STRATEGY 1		STRATEGY 2		STRATEGY 3		STRATEGY 4	
			AS	TAS	AS	TAS	AS	TAS	AS	TAS
	THREATS									
1	Many new competitors have sprung up for similar products	0.103	3.10	0.32	3.10	0.32	3.70	0.38	3.10	0.32
2	The price of product packages at lower prices than competitors	0.103	3.30	0.34	3.30	0.34	3.60	0.37	3.70	0.38
3	Creative content ads for product promotion from more competitors	0.086	3.10	0.27	3.00	0.26	3.30	0.28	3.10	0.27
4	Various types of *essential oil* products are sold online.	0.091	3.30	0.30	3.30	0.30	2.60	0.24	3.30	0.30
5	Lack of consumer knowledge about the benefits of the product and how to use it.	0.097	2.60	0.25	3.40	0.33	2.90	0.28	3.30	0.32
				6.21		**6.17**		**6.54**		**6.73**

Source: Research results, 2023

Table 4: The Results of QSPM Matrix Calculation

Alternative Strategy	Score Total
Increase product sales promotion activities	6.21
Reseller network enhancement	6.17
Establish good relationships with customers	6.54
Recruiting employees who master digital marketing	6.73

Source: Research results, 2023

DISCUSSION

The results show that strategy 4 is to recruit employees who have mastered digital marketing. Digital mastery can be directed to achieve customer satisfaction that ensures sustainable business (Hasibuan, 2020). Recruitment of employees who master information technology, especially digital marketing, is the initial and strategic stage to implement the next strategy (strategies 1, 2, and 3), namely increasing promotional activities, adding reseller networks, and maintaining product quality. Technology use greatly affects an enterprise's competitiveness (Tkachuk et al., 2020). The implementation of a strategy must pay attention to the company's resource capabilities and external conditions (Varelas & Apostolopoulos, 2020).

The implementation of the strategy of recruiting employees who are experts in mastering digital marketing can be done with various approaches such as collaborating with external parties (*outsourcing*), holding regular training, and inviting digital marketing experts to provide capacity building for employees. In the era of digital transformation, human resources who master digital technology are needed for company competition. (Putri et al., 2021). The effectiveness of publishing a business and its products digitally greatly affects the sustainability of a sustainable business (Gusdini et al., n.d.). Increasing the digital business capacity of a company will increase the

company's competitiveness (Stryzhak et al., 2021). The transformation from doing business conventionally to modern based on digital technology is a big agenda that must be understood by all employees and stakeholders of *Java Aroma Essential* MSMEs. The use of digital technology today helps companies in business competition (Febriyantoro & Arisandi, 2018).

Recruitment of employees who master digital must be immediately optimized in other activities such as marketing, maintaining product quality, establishing cooperation, and adding *reseller* networks. The strategy of strengthening digital capabilities determines the ability to compete in the technology-based business era (Voskresenskaya et al., 2020). The digital ability of employees must be equipped with good mastery of business processes, To increase the competitiveness of the company it is very necessary to be equipped with digital technology (Lorente-Páramo et al., 2021).

CONCLUSION

The essential oil industry is experiencing rapid growth, driven by the evolving lifestyles of consumers who increasingly use essential oils to enhance room comfort. This rising demand is particularly fueled by individuals with sufficient purchasing power. Java Aroma Essential, an MSME within this industry, has significantly benefited from this trend.

To navigate this growth and sustain its competitive edge, Java Aroma Essential has developed four alternative strategies through the SWOT Matrix:

Increase Product Sales Promotion Activities:

Utilize official social media accounts and online shop applications to promote products.

Endorse essential oil products through social media influencers and public figures.

Expand Reseller Network:

Establish reseller networks in major cities across Indonesia.

Provide marketing training and updated promotional content to resellers to facilitate sales

Maintain Product Quality and Customer Relationships:

Ensure high product quality and build strong customer relationships to foster loyalty.

Develop creative and competitive pricing strategies.

Recruit Digital Marketing Experts:

Hire employees with expertise in digital marketing to boost sales.

Collaborate with companies and institutions to streamline the procurement of goods and licensing services.

The most effective strategy identified for Java Aroma Essential is to recruit digital marketing experts. This approach is crucial for maximizing sales and responding to the high demand in the digital economy. Strengthening the business through technology transfer and innovation, as well as

fostering collaborations for efficient transactions and licensing, is essential for long-term sustainability (Ibidunni et al., 2020; Al-Subaie et al., 2021).

To ensure the sustainability of this rapidly growing business, it is vital to adopt a well-crafted business development strategy. The study's findings highlight the necessity for Java Aroma Essential to embrace digital marketing expertise. This strategy aligns with the current high demand and digital trends. Adapting to these changes through effective change management is critical for business resilience and growth (Havlovska et al., 2020).

By implementing these strategic initiatives, Java Aroma Essential can continue to thrive in the competitive essential oil market and achieve sustained business success.

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The two sides of *Cyberloafing*: A qualitative analysis of workers' perceptions of the negative and positive consequences of ICT usage behavior for personal purposes in the workplace

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Bibiana Giudice da Silva Cezar[1] and Kathiane Benedetti Course[2]

ABSTRACT

Abstract: There is a growing interest on the part of organizations and researchers in understanding the use of ICTs for personal purposes in the workplace, a phenomenon called *cyberloafing*. In this sense, the present research aimed to investigate the perception of ICT users in organizations about the negative and positive consequences of *cyberloafing* behavior. A qualitative study was carried out through interviews that were submitted to a content analysis. Five companies in the ICT sector located in Rio Grande do Sul were adopted as contexts of analysis, which differed in terms of the number of employees, time of operation in the market and positioning in relation to *cyberloafing* behavior. In these companies, 20 workers who admitted to engaging in such behavior were established as the unit of analysis. Regarding the negative consequences of *cyberloafing* behavior, losses in productivity and efficiency were perceived by the interviewees. Although this aspect was manifested in a significant way, positive consequences were also perceived, such as recovery in situations of fatigue and stress and the balance between the personal and professional spheres. Therefore, when considering the context in which the phenomenon occurs, it can be inferred that its negative and positive effects coexist and both affect the individual's productivity.

Keywords: *Cyberloafing*, Work environment, Consequential, Positive, Negative.

[1] Post-Grad Prog in Admin/Admin Esc - PPGA/EA/UFRGS - Federal University of Rio Grande do Sul
E-mail: bibigscezar@hotmail.com
[2] Master in Admin at Campus Sant? Ana do Livramento - MASL/UNIPAMPA - Federal University of Pampa
E-mail: kathi.corso@gmail.com

INTRODUCTION

In view of the increasing access to various information and communication technologies (ICTs) in the contemporary workplace, *cyberloafing* behavior is a topic of increasingly prevalent interest in organizations and management research in recent years (Pindek, Krajcevska, Spector, 2018). In general, *cyberloafing* can be described as the "set of behaviors in the workplace in which an employee engages in activities mediated by electronic devices, particularly through the use of the *internet*, which his immediate supervisor would not consider work-related" (Askew *et al*., 2014, p. 510).

Data demonstrate the breadth of the phenomenon. In the United States, a survey of 3,200 workers found that 64% reported practicing *cyberloafing* activities daily throughout their workday. Among this portion, 39% said they spend only one hour or less per week on online practices unrelated to work, while 29% spend up to 2 hours, 21% up to 5 hours, and 3% spend 10 hours or more using ICTs for personal purposes in a period of one week (Salary.com, 2018). In Brazil, the scenario is no different: in a sample of 1,200 professionals, seven out of ten claimed to engage in *cyberloafing* behavior, whose sum of the duration of their online activities for personal purposes can represent up to 30% of their work time (Lumiun, 2017). Many companies, when faced with such percentages, start to treat *cyberloafing* as a modern form of counterproductive behavior in the workplace, in which instead of stealing company assets, the employee starts to steal the company's productive time by using technologies for purposes unrelated to work (Kim *et al*., 2016).

This negative perspective on *cyberloafing* has been discussed in academia since the beginning of studies on behavior, seeking to understand its different antecedents (Sheikh, Atashgah and Adibdadegan, 2015), the possible effects (Koay; Soh; Chew, 2017), and ways to mitigate it (Khansa *et al*., 2017). Among the negative consequences explored in the literature, inefficiency and decreased work performance can be mentioned (Ramayah, 2010; Andreassen, Torsheim and Pallesen, 2014), financial losses (Salinas and Farfán, 2017) and threats to organizational information security (Hadlington and Parsons, 2017).

However, although fewer in number, there is also a strand in academic research on *cyberloafing* behavior that aims to relate it to possible positive consequences. Aspects such as work-life balance (König and de La Guardia, 2013; Soh, Koay and Chew, 2017), Reestablishment in situations of fatigue / stress / boredom (Ng, Shao and Liu, 2016; Arshad, Aftab and Bukhari, 2016; Pindek, Krajcevska, Spector, 2018), innovative behaviour at work (Derin and Gökçe, 2016) and promotion of social capital (Cao *et al*., 2016).

In this sense, Koay and Soh (2018) conducted a literature review to highlight that both the existence of negative and positive consequences of cyberloafing have been empirically proven in academic research, arguing that the behavior should be analyzed from both perspectives. Also

starting from a joint view, Kim and Christensen (2017) built a theoretical model to propose that cyberloafing exerts negative and positive effects on organizational results and addressed possible conditions that would mitigate or strengthen these effects.

However, although the studies by Koay and Soh (2018) and Kim and Christensen (2017) theoretically assume that both negative and positive points of view of *cyberloafing* behavior are coexisting, the authors have not conducted empirical research on the perception of individuals who practice it or live with it in their work routines. In this sense, considering the aspects mentioned above, the present study emerged from the following questions: What are the negative and positive consequences of *cyberloafing* behavior perceived by workers who use technologies in organizations? Are both consequences of behavior perceived by them as coexisting?

Thus, in order to answer these questions, the general objective was established: To investigate the perception of ICT users in organizations about the negative and positive consequences of *cyberloafing* behavior. It is justified to carry out this research in order to contribute to the results of Koay and Soh (2018) and Kim and Christensen (2017), providing empirical evidence that corroborates or contests their theoretical propositions, presenting the feasibility of the joint analysis of the negative and positive consequences of *cyberloafing behavior*.

THEORETICAL FOUNDATION

According to Jandaghi *et al*. (2015), the concern about *cyberloafing* behavior was initially addressed in 1995 in a text published in *New York's Daily News*. In his article, Tony Kamins questioned the use of new technologies, especially the *internet*, by workers for private purposes during working hours, warning that this use could be negative and result in organizational losses. In academia, the theme became more prominent with the study by Lim (2002, p. 677) who defined "any voluntary act of employees using their company's Internet access during office hours to browse non-work-related websites for personal purposes and to check (including receiving and sending) personal *emails* as a misuse of the *Internet*" and coined the term *cyberloafing* to refer to such acts.

Continuing Lim's (2002) research, academic production on the subject has been developing over time, and it is possible to mention various terminologies adopted to refer to *cyberloafing behavior*, such as *cyberslacking* (O'neill, Hambley and Bercovich, 2014), *non-work-related computing* (Son and Park, 2016), *personal web usage* (Ramayah, 2010) and, in Portuguese, cybervagrancy (Cappellozza, Moraes and Muniz, 2017). In this sense, behavior has also been analyzed in a multidimensional way, assuming that it can vary between more innocuous activities, with the intention of seeking some entertainment (watching videos on *YouTube*, browsing virtual social networks, etc.), personal utilitarian activities (paying an online bill, making a purchase through *e-commerce*, etc.), learning (watching a video lesson, reading educational content, etc.) to more

problematic activities (accessing *pornographic* sites, illegally *downloading* files, etc.) (Blanchard and Henle, 2008).

In view of the variety of activities that can be practiced due to different intentions, it is evident that this behavior can be perceived from both negative and positive points of view (Holguin, 2016). Both perspectives are presented in the following topics.

THE "DARK SIDE": NEGATIVE CONSEQUENCES OF *CYBERLOAFING BEHAVIOR*

When analyzing the possible consequences of *cyberloafing* behavior from a negative perspective, it can be inferred that the main aspect highlighted by scholars on the subject is the imminent damage to the organization as a whole. In this sense, engaging in this behavior can significantly impact the worker's performance, productivity, and efficiency, which leads to financial losses, but can also lead to the organization's exposure to electronic, legal, and image threats (Jandaghi *et al*., 2015; Hadlington and Parsons, 2017; Koay and Soh, 2018).

By spending the time and attention that should be related to the work in the use of ICTs for personal purposes, the professional exposes himself to inefficiency (Ramayah, 2010; Andreassen, Torsheim and Pallesen, 2014). Thus, in moments of distraction or procrastination, workers can open gaps for failures in the execution of tasks, meeting deadlines or serving customers (Jandaghi *et al*., 2015). Messarra, Karkoulian and McCarthy (2011) also point out that generally in smaller organizations that have fewer resources, this improper use can overload ICTs, affecting productivity.

In addition, this behavior can subject the organization's ICT network to a condition of vulnerability due to the vast existence of virtual threats (Hadlington and Parsons, 2017). Various activities such as accessing pornographic content sites or *online games* or downloading content from piracy sites can compromise organizational security by exposing it to cyber viruses. In addition to harming the full functioning of ICTs, viruses in the form of *spyware* can defraud confidential company information, causing even more serious damage (Hadlington and Parsons, 2017). This context may also involve legal inconveniences that can harm both the organization and the workers. In case of illegal practices in the use of ICTs carried out by professionals in the workplace, the organization may be required to be legally involved in such crimes. On the other hand, *cyberloafing* practices contrary to organizational norms can lead, legally, to dismissal for just cause (Salinas and Farfán, 2017).

In short, the aforementioned consequences may imply significant direct costs, reflected in financial losses. However, the authors also point out that there are indirect costs such as the potential to tarnish the organization's reputation before its customers and society in general (Messarra, Karkoulian and McCarthy, 2011).

THE "LIGHT AT THE END OF THE TUNNEL": POSITIVE CONSEQUENCES OF *CYBERLOAFING BEHAVIOR*

Although the consequences mentioned above are worrying, *cyberloafing* behavior can also be analyzed from a positive perspective. This view encompasses consequences that favor the worker in terms of productivity and development and, consequently, the organization. The most cited beneficial aspect among researchers on the subject is the feasibility of the behavior becoming an escape or recovery valve for the worker in situations of fatigue, stress or boredom. On these occasions, using ICTs for personal purposes during working hours in a controlled and responsible manner can regain the individual's spirit and disposition and, consequently, contribute to their productivity (Ng, Shao and Liu, 2016; Arshad, Aftab and Bukhari, 2016; Pindek, Krajcevska, Spector, 2018).

In addition, a positive relationship was also identified between the professional's *cyberloafing* behavior and their innovative behavior at work. Innovative behavior at work comprises the individual's creative reasoning and ability to provide ideas and solutions aimed at the development of the organization. Thus, by using ICTs for personal purposes during working hours, workers can stimulate their creativity and come up with new ideas that can somehow benefit the organizational dynamics (Derin and Gökçe, 2016).

In a complementary way, in a more collective view, *cyberloafing* behavior can promote the organization's social capital since it facilitates the sharing of knowledge among employees. This is because ICTs have the potential to strengthen the bonds of the labor network in terms of trust, enriching the performance of professionals and, as a result, the labor dynamics (Cao *et al*., 2016).

In addition to these consequences related to the development of the worker, benefiting the organization, *cyberloafing* behavior can be a way for the individual to balance the personal and professional domains of his life. The routine of contemporary society is increasingly accelerated and overloaded and, in this sense, ICTs can be essential tools for human beings in maintaining personal life, even if they are physically in the work environment (Konig and De La Guardia, 2013; Soh, Koay and Chew, 2017).

Figure 1 shows a synthesis of the different negative and positive consequences found in the literature on *cyberloafing behavior*.

Figure 1. Different negative and positive consequences of *cyberloafing behavior*

Negative	Positive
Losses in productivity and efficiency (Ramayah, 2010; Andreassen, Torsheim e Pallesen, 2014; Jandaghi *et al*., 2015)	**Restoration in situations of fatigue and stress** (Ng, Shao, and Liu, 2016; Arshad, Aftab and Bukhari, 2016; Pindek, Krajcevska, Spector, 2018)
ICT overload (Messarra, Karkoulian e Mccarthy, 2011)	**Innovative behavior at work** (Derin e Gökçe, 2016)
Exposure to cyber threats (Hadlington and Parsons, 2017)	**Promotion of social capital** (Cao *et al*., 2016)
Legal upheavals (Salinas and Farfán, 2017)	**Balancing the personal and professional spheres** (Konig and De La Guardia, 2013; Soh, Koay and Chew, 2017)
Compromise of the organization's reputation (Messarra, Karkoulian e Mccarthy, 2011)	

Source: Prepared by the authors

The consequences of *cyberloafing behavior* identified in previous studies were presented in order to investigate in the present research which of these are perceived by workers who use ICTs in organizations and whether such consequences are perceived in a coexisting way. Thus, the following topic presents the methodological procedures adopted in order to achieve the delimited objective.

METHODOLOGICAL PROCEDURES

Aiming to achieve the established general objective, a descriptive research was carried out, portraying the consequences of *cyberloafing* behavior perceived, both negative and positive, by ICT users in organizations, specifying their particularities (Sampieri, Collado and Lucio, 2013). Consequently, also by virtue of its purpose, the present study was developed from a qualitative approach, proposing to investigate *cyberloafing* behavior within its natural context, trying to understand, or interpret, its consequences in terms of the meanings that its practitioners attribute to it (Denzin and Lincoln, 2011). In this sense, the individuals adopted as the unit of analysis were allowed to feel free to express their individual perspectives in the most authentic way possible, without limiting themselves to a pre-defined set of closed answers. Thus, although such results may not represent the general in its entirety, they contribute details and subjectivities and provide real situational examples that could be covered by metrics and quantifications (Stake, 2016).

The data necessary for the present research were collected through individual interviews using a semi-structured script prepared by the authors based on the theoretical framework on 1) perceptions about their *cyberloafing behavior* and the behavior of other colleagues (Askew *et al*., 2014; Sheikh, Atashgah and Adibdadegan, 2015); 2) perceptions about negative consequences of their *cyberloafing* behavior and the behavior of other colleagues (Messarra, Karkoulian and McCarthy, 2011; Hadlington and Parsons, 2017); and 3) perceptions about positive consequences of their *cyberloafing behavior* and the behavior of other colleagues (Derin and Gökçe, 2016; Cao *et al*., 2016; Soh, Koay and Chew, 2017). When inquiring aspects related to the behaviors of other colleagues, the researchers based themselves on projective data collection strategies that are used in studies on themes that have

some social concern involved and, therefore, may not be reported by the interviewees in a precise and sincere way. Thus, it is a way of inferring hidden motivations, intrinsic to the individual, of which he describes another individual and not himself (Hair *et al*., 2005). The interview script was analyzed and reviewed by an expert on the subject in order to validate it.

The choice of the contexts of analysis was based on contact with 265 organizations listed on the website of the Union of Information Technology and Data Processing Companies of the State of Rio Grande do Sul (SEPRORGS) seeking to verify availability to participate in the research and characteristics such as number of employees, time in the market and the way the company deals with *cyberloafing* behavior. The SEPRORGS website was adopted as the basis for the search, considering that the companies contained in it are located in the state of Rio Grande do Sul – Brazil, for the convenience of the researchers, and operate in the Information and Communication Technology sector, consequently, implying intense contact with different ICTs by the individuals inserted in it, which can be characterized as contexts conducive to investigation on the behavior of *cyberloafing*. From this contact, among the companies that demonstrated assertiveness in carrying out the survey, five companies were chosen in order of response, seeking to achieve a variety in relation to the number of employees, time in the market and organizational positioning in relation to *cyberloafing behavior*. The companies are described in the topic of presentation and discussion of the results.

In view of how the choice of the contexts of analysis was made, the delimitation of the units of analysis is made explicit, since the investigation took place at an individual and not an organizational level. With the criterion of being ICT users and claiming to engage in *cyberloafing* behavior, four workers were determined as units of analysis in each organization, seeking that at least one of them occupy a management position, totaling twenty interviewees. Like companies, such individuals are duly presented in the following topic.

In this sense, a visitation protocol was followed in each context of analysis for data collection. Upon arriving at the company at the beginning of the workday, the researcher recognized the company with its manager in order to understand its contextual characteristics. Then the interviews began and, in the interval between them, observations of the work dynamics were carried out. The researcher's notes on her visits to the companies were compiled with the data from the interviews, which were recorded in audio and later transcribed and printed for analysis.

A content analysis was carried out by categorizing the raw data obtained according to the knowledge of the theory and sensitivity of the researcher in relating his corpus of analysis. This categorization occurs *a priori*, defining categories previously according to the researcher's specific search, or *a posteriori*, emerging from the content collected and the author's transition between the corpus of analysis and theory (Bardin, 2011; Franco, 2008). In the present study, the theme of consequences of *cyberloafing* behavior was categorized a priori by the researchers as 1) negative

consequences and 2) positive consequences. Based on the data collected, subcategories were defined *a posteriori* referring to the aspects highlighted by the interviewees in their statements: a) losses in productivity and efficiency; b) recovery in situations of fatigue and stress and c) balance of the personal and professional spheres. It is noteworthy that aspects related to the other consequences mentioned in the literature, such as ICT overload, Exposure to virtual threats, Legal disorders, Compromise of the organization's reputation, Innovative behavior at work and Promotion of social capital were not manifested in the statements of the interviewees and, therefore, were kept out of the a *posteriori* categorization. The categorization performed can be seen in figure 2.

Figure 2. Categorization for content analysis of collected data

Theme	**Categories (defined *a priori*)**	**Subcategories (defined *a posteriori*)**
Consequences of *cyberloafing behavior*	Negative Consequences	Losses in productivity and efficiency
	Positive Consequences	Restoration in situations of fatigue and stress
		Balance of the personal and professional spheres

Source: Prepared by the authors based on research data

To validate the qualitative analysis carried out, the interviewees were sent via *e-mail* the transcript of their interview and a preliminary analysis of the respective data obtained so that they could verify the content and credibility of the interpretations, mitigating erroneous interpretations of the meaning attributed to the phenomenon investigated. After the consent of the interviewees, the data analysis continued, which was submitted to external verification of the process and product of the report by an expert to validate the categorization (Creswell, 2014).

PRESENTATION AND DISCUSSION OF RESULTS

Although the present research has focused on the individual and not the organizational level, it is important to characterize the five companies in the ICT sector defined as contexts of analysis, denominated as Alpha, Beta, Omega, Delta and Gamma. In this sense, it is possible to see in figure 3 the main area of activity of each company contained in this study, the region of the state of Rio Grande do Sul in which they are located, the number of employees, time of operation in the market, the way they deal with *cyberloafing* behavior and the interviewees who work in them represented by the labels used to refer to them throughout this research.

Figure 3. Characterization of the contexts of analysis

Enterprise	Alpha	Beta	Omega	Delta	Range
Area of expertise in the ICT sector*	Software Development and Services Bureau	Fábrica de *software*, *business intelligence*, *mobile* e *outsourcing*	Website development and *digital* marketing	Desenvolvimento de *software*	*ERP* software *development* and *back office* for *e-commerce*
RS Region	Metropolitan of Porto Alegre	Metropolitan of Porto Alegre	Northwest	Metropolitan of Porto Alegre	Northeast
Collaborators	17	96	35	88	37
Acting time	23 years old	4 years	11 years	4 years	7 years
Positioning in relation to *cyberloafing*	Permissive	Permissive	Permissive	Restrictive	Restrictive
Respondents	E1, E2, E3 and E4	E5, E6, E7 and E8	E9, E10, E11 and E12	E13, E14, E15 and E16	E17, E18, E19 and E20

* According to the SEPRORGS website (http://www.seprorgs.org.br/pt/associados/associados)
Source: Prepared by the authors based on research data

Thus, considering that the interviewees referred to as E1, E2, E3 and E4 work in the company Alfa, the interviewees E5, E6, E7 and E8 in the company Beta, the interviewees E9, E10, E11 and E12 in the company Omega, the interviewees E13, E14, E15 and E16 in the company Delta, and the interviewees E17, E18, E19 and E20 in the company Gama, Figure 4 shows their individual characteristics.

Figure 4. Characterization of the individuals units of analysis

Interview with the	Sex	Age	Marital status	Offspring	Function	Acting time
E1	M	38	Married	Yes	Managing partner	19 years old
E2	M	38	Married	Yes	Responsible for customer prospecting	9 years
E3	F	32	Married woman	No	Marketing Analyst	6 years
E4	F	44	Stable Union	Yes	Commercial Manager	11 years
E5	M	53	Married	Yes	Managing partner	4 years
E6	F	44	Married woman	Yes	Business Intelligence Analyst	2 years
E7	M	27	Single	No	Administrative Assistant	1 year
E8	F	41	Stable Union	Yes	Human Resources Manager	2 years
E9	M	30	Single	No	Managing partner	11 years
E10	F	30	Married woman	Yes	Project Analyst	10 years
E11	M	32	Single	No	Creative Manager	8 years
E12	F	24	Single	No	Digital Marketing and Intelligence Manager	1 year
E13	M	28	Single	No	Managing partner	3 years
E14	F	27	Single	Yes	Support Analyst	3 years
E15	F	39	Single	No	Human Resources Manager	1 year
E16	F	26	Single	No	Endomarketing Intern	1 year
E17	M	48	Married	Yes	Managing partner	7 years
E18	M	36	Married	Yes	Marketing *and Partnerships* Manager	1 year
E19	F	26	Stable Union	No	Marketing Analyst	2 years
E20	M	38	Single	No	Infrastructure Manager	7 years

Source: Prepared by the authors based on research data

As shown in figure 3, the five ICT companies adopted as contexts of analysis vary in relation to the number of employees, with the Alpha, Omega and Gama companies having a smaller number and the Beta and Delta companies with a larger number. As for the time of operation in the market, it

is verified that the Beta and Delta companies are relatively young, while the Alpha and Omega companies have a longer period of operation and the Gama company is in the middle ground. Regarding the way to deal with *cyberloafing* behavior, a variation can also be perceived: while the companies Alpha, Beta and Omega demonstrated that they broadly allow the use of ICTs for personal purposes by their employees, the companies Delta and Gama claimed to restrict this behavior, blocking access to content such as virtual social networks (*Facebook*, *Instagram*, *Twitter*, etc.), *YouTube*, *news and sports* sites, and *streaming apps* (*Spotify*, *Netflix*, etc). It is considered that achieving a certain diversity is important so that the results are not restricted to a specific scenario.

As can be seen in figure 4, among the twenty interviewees there are ten female individuals and ten male individuals, an average of thirty-five years of age, eleven individuals married or in a stable union and nine single individuals, ten having at least one child and ten without children. In each of the companies characterized above, a manager and three employees with different functions were interviewed, responsible for the areas of *marketing*, human resources, commercial/customers, *business intelligence*, projects, infrastructure and administrative. Individuals who have been working in the respective companies for only one year are verified to individuals who have been working for nineteen. As in relation to the characteristics of the companies, it is considered that a diversity of respondents' profile was achieved, which can contribute to the results.

In addition to the individual characteristics mentioned above, it is considered relevant to present the profile of *cyberloafing* behavior of the interviewees. Therefore, a positioning matrix was elaborated according to the different practices of use of ICTs for personal purposes in the work environment that each individual unit of analysis manifested to perform, presented in figure 5.

Figure 5. Positioning matrix of *cyberloafing* practices manifested by individuals analysis units

Cyberloafing *Practices*	Interviewed																				T
	E 1	E 2	E 3	E 4	E 5	E 6	E 7	E 8	E 9	E 10	E 11	E 12	E 13	E 14	E 15	E 16	E 17	E 18	E 19	E 20	
Access virtual social networks	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	×	✓	×	✓	✓	×	16
Participate in conversations on virtual social networks (*chat*)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	20
Check/Receive/Send *emails* not work-related	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓	19
Access *news* sites / apps	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	×	✓	✓	✓	✓	✓	18
Watch video lessons	×	×	×	×	×	✓	×	×	✓	×	×	×	✓	✓	×	×	×	✓	✓	×	6
Study/Read *Online*	×	×	×	×	×	×	✓	×	✓	×	✓	×	✓	✓	×	×	✓	✓	✓	✓	9
Watch series / movies	×	×	×	×	×	×	×	×	×	×	✓	×	×	×	×	×	×	×	×	×	1
Watch videos	×	✓	×	×	✓	×	✓	×	✓	×	✓	×	✓	×	×	×	✓	×	×	✓	8
Listen to music	×	✓	×	×	×	✓	✓	×	✓	×	✓	✓	✓	✓	×	✓	✓	✓	✓	×	12
Log in / buy in E-commerce *Websites* / *Apps*	✓	✓	✓	×	✓	×	✓	×	✓	✓	✓	×	✓	✓	×	×	✓	✓	×	×	12
Access *finance/banking* websites/apps	✓	×	×	×	✓	✓	✓	✓	✓	✓	✓	×	✓	✓	×	×	×	✓	✓	×	12
Search for a job	×	×	×	×	×	✓	×	×	×	×	×	×	×	×	×	×	×	×	×	×	1
Download personal content	✓	×	×	✓	✓	×	×	×	✓	✓	✓	×	✓	×	×	×	✓	✓	✓	×	10
t	7	7	5	5	8	8	9	5	11	7	11	2	11	9	2	5	8	10	9	5	

Legend: ✓ = Practiced; × = Not practiced; T = Total number of respondents who practice each activity (n / 20); t = total activities practiced by each interviewee (n / 13);

Source: Prepared by the authors based on research data

In view of the data shown in figure 5, it can be seen that there was a significant manifestation of *cyberloafing* practices by the interviewees, with thirteen individuals reporting that they performed seven or more different *cyberloafing* practices. Among these practices, participation in conversations in virtual social networks (*chat*) stands out, referred to as an activity practiced by all interviewees, who highlighted the use of *WhatsApp* and Facebook *Messenger*; checking, receiving or sending *emails* not related to work, practiced by nineteen; access to *websites* or *apps* of news practiced by eighteen and access to virtual social networks practiced by sixteen. It should be noted that individuals who work in companies that restrict the personal use of ICTs through blockades claimed to engage in *cyberloafing* behaviors using their *smartphones* and *private mobile* internet plans.

Knowing the contexts and units of analysis of the present study, the following topics present and discuss the results regarding perceptions about the consequences of cyberloafing behavior.

PERCEPTIONS OF NEGATIVE CONSEQUENCES OF *CYBERLOAFING BEHAVIOR*: LOSSES IN PRODUCTIVITY AND EFFICIENCY

The contemporary organizational environment permeated by technological devices and made up of individuals increasingly engaged with such technologies is characterized by experiencing a constant and complex challenge. At the same time that technological advancement and the intense

human-technology relationship provide several opportunities for companies, this context may involve some threats, mainly behavioral (Tarafdar *et al*., 2015; Venkatraman *et al*., 2018).

In this sense, despite the myriad of benefits provided by ICTs to organizations, which are fundamental for obtaining competitive advantage, these technologies also arouse deviant behaviors on the part of individuals in the workplace. Koay and Soh (2018) relate this issue to the productivity paradox brought to light by Brynjolfsson in 1993, since ICTs implemented to improve productivity and efficiency may be used inappropriately, generating the opposite effect to the desired one.

Therefore, by engaging in *cyberloafing* behavior, the individual may suffer losses in their productivity and efficiency. These losses can affect both the professional and the company as a whole, since such practices open loopholes for failures in the execution of tasks and in meeting deadlines (Ramayah, 2010; Jandaghi *et al*., 2015; Andreassen, Torsheim and Pallesen, 2014). One of the reasons why the behavior can have negative effects is digital distraction, since the use of these technologies for matters not pertinent to organizational interests causes a deviation of concentration and focus, which can compromise the achievement of their demands in quantity and quality (Cappellozza, Moraes and Muniz, 2017).

Losses in productivity and efficiency as a negative consequence of *cyberloafing behavior* were perceived by the interviewees of the present research. In their speeches, these individuals highlighted, above all, the imminent distraction and lack of concentration generated by the technological devices and functionalities provided by the *internet*, demonstrating that they were aware of the possible losses involved.

> "Oh, I think there's the harm of distraction, right, that you end up using technology a lot and blur yourself. People are working, in a meeting, in a business and are distracted by their cell phones, with Facebook on their cell phones beeping there. So I think that when you're not focused the quality of your work drops, you miss some detail. For example, you're homologating some value, you didn't homologate it correctly, you didn't evaluate it right, right, for these reasons of distraction". (E6)

> "I see a lot of distraction. That is very clear. They (ICTs as virtual social networks) end up being a distraction and you lose focus on your main objective, which would be your work, you stop performing tasks to distract yourself on social networks. Waste your productive time in the truth." (E11)

> "If I'm in the middle of an important task and suddenly a message comes on my cell phone and I go to look at it, it has already broken my line of reasoning. Here, all tasks require concentration, In basically everything, from customer service, or you're developing code, or you're working on a project and you need unique attention. So, whenever there is distraction at times when you need a lot of concentration, it's very bad, it's going to explode somewhere." (E17)

> "It's a problem, because it occupies you, it takes you time on top of that business that often doesn't bring you important differential information, it's just a time killer. It generates lack of concentration, lack of focus, the guy takes longer to do an action or keeps postponing the beginning, I think that this part of distraction that these sites generates in us within the work environment is quite negative. But it is not easy to measure how much productivity has been

> lost, as in a manufacturing process, for example. When we deconcentrate, productivity drops." (E18)

In this sense, it can be seen in the reports of the interviewees that smartphone notifications and social networks are the aspects that most cause distraction and, consequently, losses in productivity and efficiency. In addition, the damage to the continuation of the organizational demands of the team as a whole was highlighted, since the distraction by cyberloafing behavior can delay the processes of other employees.

> "Especially this issue of leaving the demands for later and staying on social networks in a place where you need, many times, a task that is yours, that another person to continue, needs this conclusion. It depends on someone else. So, while this person is distracted on social networks, he does not do this task and the other person cannot continue. So this ends up affecting a whole cycle if you don't focus on the tasks, I see this a lot". (E12)

> "Because here if you don't supply your colleague with the next information or system, we don't get to the next step. Then no one can deliver the projects, the tasks within the established deadlines". (E9)

It was also found that the losses of concentration and time due to the cyberloafing behavior mentioned by the research participants were related by them to aspects related to the lack of self-control, in which the individual ends up not limiting the time spent. This lack of self-control may originate, in more severe cases, from a compulsion to use such devices, constituting a problematic use (Yan and Yang, 2014; Keser, Kavuk and Numanoglu, 2016).

> "Facebook, social networks, I think that during working hours is something that demands a lot of self-control. I don't know if people nowadays have all this self-control. In fact, I think there is a lack of self-control in relation to the time of use and then they get lost, it becomes exaggerated and harmful". (E1)

> "Oh, there's that feeling of wanting to always be on top of what's happening and sometimes even things that don't relate to the moment you're there, right, the work environment. But it's that compulsion for technology. I think it's exaggerated, the person loses the limit like that, right, let's say, the notion. (E4)

> "When the cell phone is beeping and then that little blue light is flashing and you are in agony to know what's going on, right. That's why I use it a lot, I use it inside and I use it outside too. I think I use it too much. I think I use a higher percentage than I should and I end up getting in the way of using more than I should." (E6)

> "What they can limit is that it takes away my concentration, sometimes you: ... 'Oh, I'll take a look', but you end up staying a long time. Sometimes, maybe I 'just want to take a look', but when you see it, I'm looking too much. When you see it, I've been there for an hour sailing and then I lose this work time". (E10)

It is highlighted in the literature that ICTs as virtual social networks are developed through strategies to captivate their users promptly, attracting their attention for long periods. Developers increasingly use infinite scrolling (presenting content on a single page instead of spreading it over a series of pages) and gamification (using gaming experience to perform activities) instigating their

users to consume more time than intended (Neyman, 2017). In this sense, notifications and the possibilities of social interactions activate a reward system in the individual's brain, generating a positive response in their psychology capable of directly interfering in the individual's professional performance and productivity, since it causes loss of concentration and interruption in the execution of work activities (Cappellozza, Moraes and Muniz, 2017).

In summary, it can be seen in the reports of the interviewees that they perceive the losses in productivity and efficiency as a negative consequence of the cyberloafing behavior, especially with regard to the distracting power of ICTs such as virtual social networks and the smartphone and the lack of self-control in relation to the time spent in this use, causing them to lose focus and also hindering the continuation of the demands of the work and processes of the other team members. Considering this negative consequence, the following are the positive consequences perceived by the interviewees of this study.

PERCEPTIONS OF POSITIVE CONSEQUENCES OF CYBERLOAFING BEHAVIOR: RECOVERY IN SITUATIONS OF FATIGUE AND STRESS AND BALANCE OF THE PERSONAL AND PROFESSIONAL SPHERES

In the context of the ICT sector, characterized by technological organizational environments and complex dynamics, the functions and demands of work require dedication and intense efforts from workers. In these cases, it is common for individuals to feel overloaded in their mental processes, presenting symptoms of stress and fatigue in the work environment (Carlotto, 2010). In this sense, cyberloafing behavior can be considered an imminent outlet or recovery for the individual in situations of fatigue or stress. Thus, the use of these technologies for particular purposes in a controlled manner and with the objective of regaining mood and disposition, allows the worker to recover (Coker, 2013; Jandaghi et al., 2015; Salinas and Farfán, 2017). This positive consequence of cyberloafing behavior is perceived by the interviewees in the present research and manifested in their statements.

> "It's part of what we do, the type of work, to stop at a certain moment, to relax, to see a site that is more interesting, to access a social network, to reduce a little what you're doing, that task that is stressing, to be able to relax and then come back. I think it's an interesting thing to de-stress, to be able to take a breather. To be able to engage the next task or continue in an activity that demands a lot of energy". (E1)

> "I use it a lot, in the sense of using WhatsApp when I'm stressed about something, talking to a friend, talking to my husband, looking for a sister or someone to give support in the sense of: ... 'Oh I'm stressed, I need to change the subject and talk about other things'. WhatsApp for me is an escape in that sense, okay. I can get away from my routine of the stress of work there with this, right. I also participate in some groups on WhatsApp and this makes me able to disconnect a little in this sense". (E6)

> "We do not give up technology even if the fruit of that stress has been generated by the use of technology. I think that technology always helps in some way, for example, any lighter

> content that we access helps us to de-stress and unwind, listen to music, watch a video, it works in these cases". (E13)
>
> "There is no such thing as a person who only works, works, works, right? You have to have these moments to de-stress, relax, it's also super positive in the work environment. Wow, I'm very stressed about one thing, I'm going to take a break, I'm going to have a coffee, I'm going to look at my social networks, I'm going to look at some photos, something I'm going to do that I recharge and that I think is really cool. It helps because sometimes you end up yielding less because of your own fatigue, right". (E17)

Although cyberloafing behavior characterizes a challenge for contemporary organizations due mainly to the imminent loss in productivity, the phenomenon in question can be analyzed from a positive perspective. In this sense, in view of the numerous functionalities provided by ICTs, the possibility of such behavior allowing a recovery in situations of fatigue and stress is highlighted, benefiting the worker and the company as a whole, and may even favor the individual's productivity (Coker, 2013; Jandaghi et al., 2015; Salinas and Farfán, 2017).

This paradoxical relationship is explained by the fact that individuals who are stressed or tired due to their work demands and the dynamics of the organization or sector in which they work may become ineffective or less productive. This is because these feelings generate physiological and psychological effects that inhibit the worker from performing his or her activities fully as expected (Jex et al., 2007). Thus, although the interviewees perceive the negative side related to the loss of time and concentration when engaging in cyberloafing, they emphasize the importance of using technologies for personal purposes in the work environment at times when they are feeling stressed or tired, in order to recover and resume their tasks.

Still related to the contemporary organizational routine, which is characterized by being more accelerated and intense, which can overload individuals, it should be emphasized that this dynamic is not restricted only to the work environment, since individuals act socially in different roles, which includes their family relationships. In this sense, considering that the social roles of individuals coexist in parallel, they experience a constant challenge: to balance the personal and professional domains of their lives so that both needs are met. Thus, the number of personal and professional demands and the importance attributed to each one by the individual will define how much it will permeate both spheres, whether in the work or family environment (Clark, 2000).

In this context, it is verified that cyberloafing behavior can be positive since it helps workers to manage their private life while physically being in the organization (Konig and de La Guardia, 2013; Soh, Koay and Chew, 2017). Thus, in the present research, it was perceived by the interviewees that the use of ICTs for personal purposes in the work environment contributes positively to their efforts to balance their family and professional demands.

> "It helps me to solve things at home, like, my husband works the same time as me so I can use the cell phone, talk on Whats, these things are good for us to get organized, like: ... 'Oh,

> I'm going to have lunch at home today'... 'Can you pass the super for me?' These things to organize your personal life." (E3)
>
> "I use Whats a lot at work to communicate mainly with my daughter. And this is positive for me because I even work more relaxed knowing that my daughter answered me a Whats that everything is fine on her day. If I didn't have WhatsApp and contact with her, I would already be more worried. So this whole issue even helps me to perform my professional activities better, because I will be calm, as if I were there with my daughter". (E4)
>
> "I have a small son, he is months old, I just came back from leave to work, so I would be very anxious if I didn't hear from him during the day, right. Everyone asks: ... 'Oh, how was your return to work?'. And I always say that I thought it would be harder, you know? But as I can get news of my son, like, in real time, so it reassures me a lot and I work better for sure, knowing everything that's happening with my son." (E7)
>
> "I think it's important not to disconnect from family, I think this is a point to think about, it makes a lot of sense to me. Nowadays we spend most of our day here at the company and being able to be in contact with the family, even if far away, it is important to keep this contact with my family while I am not with them, knowing my son, my wife, in short, it is something that I do not give up". (E18)

By analyzing the statements of the interviewees, it can be seen that the importance attributed by individuals to the use of ICTs in the work environment as a way to meet their personal demands, especially family ones. Such perceptions can be related to the concept of mobility provided, mainly, by the smartphone which, connected to some form of internet network, enables the individual to overlap contexts in which he can exercise his different social roles in a broad way, regardless of the time and space in which he finds himself (Corso, Cavedon and Freitas, 2015). In this sense, the accessibility to these devices allows the personal and family demands of individuals to be met during their working hours (time) and in their work environment (space).

Added to this is the synchronous communication facilitated by software such as WhatsApp. This technological resource has as its main characteristic the intimate and immediate communication whose users exchange information in real time privately with one or more people (Church and Oliveira, 2013). Therefore, WhatsApp can contribute to the management of aspects of individuals' personal lives, even in a work environment, with the advantage of enabling instant communication.

These aspects become even more beneficial considering the fact that personal and family demands and professional demands can be conflicting for the individual, since resources such as time and energy are finite and that, in some situations, there is a need to prioritize one domain over the other (Halbesleben and Zellars, 2007). In this sense, cyberloafing behavior emerges as an alternative to achieve balance between work and family, raising positive effects both for the individual and his loved ones and for the organization in which he works, since such conflict can harm both spheres of his life.

FINAL CONSIDERATIONS

In view of the results obtained, it can be concluded that the general objective proposed by this research was achieved, to investigate the perception of ICT users in organizations about the negative and positive consequences of *cyberloafing behavior*.

Among the negative consequences of *cyberloafing* behavior found in the theory on the subject, the individuals perceived units of analysis and manifested in their reports losses in productivity and efficiency (Ramayah, 2010; Andreassen, Torsheim and Pallesen, 2014). In the interviewees' statements, the distractions caused by *smartphone* notifications and social networks were highlighted as the aspects that most cause losses in productivity and efficiency, even harming other teammates in the pursuit of their tasks (Cappellozza, Moraes and Muniz, 2017).

Although this negative consequence of *cyberloafing* behavior was manifested in a significant way, positive consequences were also perceived by the interviewed workers, such as the recovery in situations of fatigue and stress and the balance between the personal and professional spheres. In this sense, it was found that the use of ICTs for personal purposes in the work environment can help workers to reestablish themselves and return to work demands, in addition to allowing them to meet their family demands during working hours (Konig and De La Guardia, 2013; Ng, Shao and Liu, 2016; Arshad, Aftab and Bukhari, 2016; Soh, Koay and Chew, 2017).

It is noteworthy that the results were collected from individuals who varied in terms of age, gender, family structure, function in the organization in which they work and time of work, and that the phenomenon was investigated in contexts of companies that allow the use of ICTs for personal purposes in the work environment and in companies that restrict such use. Despite this diversity, the fact that perceptions are similar allows us to infer that *cyberloafing behavior* emerges, at first, from a society increasingly linked to technologies that experiences organizational environments also equipped with different *hardware* and *software* essential for the realization of its business (Koay and Soh, 2018). In this context of intense and extensive contact with ICTs, the phenomenon becomes commonplace. It is also worth highlighting the aspects of excessive use of ICTs found in some statements, causing the individual to lose their self-control and start to use such devices impulsively in an excessive way and at inappropriate times, such as between work demands that require severe attention (Yan and Yang, 2014; Keser, Kavuk and Numanoglu, 2016).

Therefore, when considering the context in which the phenomenon occurs, it is possible to infer its negative and positive effects coexist and both affect the individual's productivity. On the unfavorable side, *cyberloafing* behavior is capable of distracting individuals during the execution of their work tasks, causing them to lose time and focus. On the other hand, it can provide benefits to their productivity and well-being by contributing to the recovery of the individual in situations of

fatigue and stress arising from work issues and to achieving a balance between their professional and family demands.

In this sense, it is not appropriate to draw a definitive conclusion about the negative and positive consequences of *cyberloafing*, nor to make a value judgment about which side would stand out from the other. This is because rapid technological advancement gives rise to different types of behavior related to the use of ICTs as well as there are different situational/environmental or individual antecedents and each of these can have a different effect on the individual and organization (Koay and Soh, 2018).

This reflection on the joint perception of the positive and negative consequences of *cyberloafing* by ICT users is proposed by the present research as a contribution to the theory on the subject. It was intended to contribute to the theoretical studies of Koay and Soh (2018) and Kim and Christensen (2017), empirically emphasizing that individuals who practice and live with such behavior perceive both sides of the use of ICTs for personal purposes in the workplace. As for management practice, what is proposed with the results presented is a comprehensive look at *cyberloafing*, without treating it only as a deviant behavior but also without neglecting its potential adverse effects. Especially with regard to the design of organizational policies related to the use of ICTs for personal purposes, since a very rigid position can lead to dissatisfaction among employees, who may start to circumvent the control mechanisms (Messarra; Karkoulian; McCarthy, 2011; Koay and Soh, 2018).

Although it has achieved the established objectives, contributing to the advancement of management theory and practice, it is recognized that the present study has limitations. As it is a qualitative study with a small number of research participants, the results obtained and the interpretation made by the researcher cannot be considered extensive to other realities, since they may be particular to the individuals analyzed. Therefore, it is suggested for future research to combine the results of this research with the model proposed by Kim and Christensen (2017) so that an instrument for collecting quantitative data can be developed and validated, allowing analysis from both angles of *cyberloafing* with a significant sample of individuals.

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Unveiling the intelligence spectrum: Neuroscientific insights into giftedness

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Annibal Gouvêa Franco[1] and Melissa Marcílio Batista[2]

ABSTRACT

This academic work encompasses neurosciences, high abilities, and giftedness. It aims to present a review that integrates areas involving the neurosciences of behavior and cognition, and their contribution to the gifted, potentially proving useful for educators in the field of high abilities and giftedness. The study is justified by the fact that despite the aforementioned assistance to gifted students being controversial and their identification difficult, Brazil's Resolution No. 4 (2009) establishes operational guidelines for Specialized Educational Assistance in basic education, in the special education modality, which encompasses students with high abilities and giftedness. The methodology used was a narrative review. It is emphasized that an educator who ventures into the neurosciences and learns about brain functioning begins to exercise their work more meaningfully and efficiently, considering that it is possible to relate certain neuroscientific evidence with theoretical-pedagogical bases.

Keywords: Education, Giftedness, High Abilities, Intelligence Spectrum, Neuroscience.

[1] Master's degree in Design (Design, Innovation, and Sustainability), UEMG
E-mail: francoartedesign@gmail.com
LATTES: https://lattes.cnpq.br/1388138609353813
ORCID: https://orcid.org/0009-0006-9134-300X
[2] Executive MBA in Management Processes, Faculdade Iguaçu
E-mail: m.lissa.marcilio@gmail.com
LATTES: https://lattes.cnpq.br/9733995262422995
ORCID: https://orcid.org/0009-0008-3556-8479

INTRODUCTION

According to Lent (2004, p. 6), what is simplistically named neuroscience is actually neurosciences due to the multiplicity of approaches. A simpler and schematic way of classifying them is through categorization into five major areas: molecular neuroscience, cellular neuroscience, systemic neuroscience, behavioral neuroscience, and cognitive neuroscience. The author warns that the boundary between these disciplines is not clear due to the interdisciplinarity between the areas of neurosciences, which implies alternating from one discipline to another whenever one intends to understand the functioning of the nervous system. The author also states that professionals dealing with this system are usually of two categories: neuroscientists, whose activity involves conducting scientific research in the areas of neurosciences, and health professionals, whose activity involves the preservation and restoration of the functional performance of the nervous system.

Considering the above, professionals dealing with neurosciences usually have their training in biology, biomedical sciences, or health sciences colleges. These professionals then undertake a postgraduate program specifically focused on the nervous system and finally become university professors or researchers at non-university scientific institutions, with their work funded by government or private resources, and their results published in specialized scientific journals.

However, contemporaneously, Lent (2004, p. 6) states that other professionals have shown interest in studying the nervous system, such as engineers, especially those focused on computer science, as computers and some robots have architectures designed based on concepts originating from Neurosciences. In an attempt to master concepts such as the visual perception of colors and movement, graphic artists and visual programmers have also approached Neurosciences. Concerning professionals seeking neurosciences, educators and pedagogues are mentioned as being interested in understanding how the nervous system exercises the capacity to select and store information, an important attribute of learning processes.

The aforementioned author highlights the relevance of multidisciplinary action in the field of neurosciences, which is becoming progressively indispensable, considering the reality that the nervous system has various layers of existence and its complete understanding requires multiple approaches. It is observed that hospital health teams are generally multi-specialized, and current neuroscientific research involves collaboration among different specialists.

According to Kandel (2014, p. 5), the last frontier of biological sciences involves understanding the biological basis of consciousness and the brain processes by which humans feel, act, learn, and remember. In his work, the author seeks to unite the study of behavior (the science of the mind) and neurosciences (the science of the brain). In a unified approach, in which mind and body are not seen as separate entities, he supports the view that all behavior results from brain function. What is usually called the “mind” consists of various operations performed by the brain,

whose processes form the basis not only of motor behaviors but also of complex cognitive acts and behaviors. Therefore, all behavioral, affective, and cognitive disorders that characterize psychiatric diseases result from brain function disorders.

According to Kandel (2014, p. 5), neurosciences integrate the task of explaining behavior in terms of brain activity and progress in explaining human behavior. According to Kandel (2014, p. 6), during the 20th century, a vision emerged about how nerve cells, the brain, and behavior are viewed. This vision arose from the synthesis of five experimental traditions: anatomy, embryology, physiology, pharmacology, and psychology. It is known that in the second century, the Greek physician Galen proposed that nerves would conduct a fluid secreted by the brain and spinal cord to peripheral tissues; this view dominated Western medicine until the microscope revealed the true structure of cells in nervous tissue. As the author reports, nervous tissue did not become a subject of special science until the late 19th century when detailed and accurate descriptions of nerve cells were produced by the Italian Camillo Golgi and the Spaniard Santiago Ramón y Cajal.

Behavior in the context of psychological thought, according to Kandel (2014, p. 6), emerged when ancient Greek philosophers speculated about the causes of behavior and the relationship of the mind with the brain, a period dating back to the beginning of Western science. However, it was only in the mid-19th century that Charles Darwin set the stage for the modern understanding of the brain as the origin of all behavior. According to the author, Darwin considered that animals could serve as models for studying human behavior, and thus, the study of evolution gave rise to ethology, which involves investigating the behavior of animals in their natural environment; later, through experimental psychology, human and animal behavior is studied under controlled conditions. In the early 20th century, Sigmund Freud introduced the first systematic cognitive psychology, psychoanalysis, which structured the enormous problems faced in trying to understand the human mind.

In Kandel's (2014, p. 6) view, around 1800, attempts began to integrate biological and psychological concepts in the study of behavior, a time when the Viennese physician and neuroanatomist Franz Joseph Gall was a pioneer in attempting to enumerate the regions of the brain and their functions. However, as the author points out, Gall's experimental approach was quite naive, as he ignored all evidence derived from examinations of brain lesions, discovered clinically or produced surgically in animal experiments. Erroneously influenced by physiognomy, a popular belief in the idea that facial features reveal character, Gall believed that bumps and indentations on the surface of the skull of gifted people with certain faculties identified the centers of these faculties in the brain.

From Kandel's (2014, p. 7) perspective, it was in the late 1920s that Gall's ideas were subjected to experimental analysis by the French physiologist Pierre Flourens, through the systematic

destruction of the functional centers outlined by Gall in the brains of experimental animals. Flourens tried to isolate the contribution of each supposed brain organ to behavior and concluded that specific brain regions are not responsible for specific behaviors but that all regions of the brain, especially the cerebral hemispheres of the forebrain, participate in each mental operation. Thus, the researcher believed that any part of a cerebral hemisphere would be capable of performing all the functions of that hemisphere and that a lesion in any area of the cerebral hemispheres should, therefore, affect all its functions equally.

From the perspective of Guerra and Cosenza (2011, p. 142), among the areas of study in neurosciences are cognitive functions and behavior, resulting from the activity of the nervous system and its specific functions. According to the authors, neuroscientific knowledge has developed significantly in recent years, particularly since the "Decade of the Brain," proposed by the United States Congress for the years 1990 to 1999, but they state that cognitive processes are still not fully understood due to the technical and ethical limitations that the study of human behavior imposes.

In the educational context, Guerra and Cosenza (2011, p. 141) present the purpose of education, which aims at the development of new knowledge or behaviors. The evidence of learning occurs when the individual is able to exhibit and express this new knowledge or behavior acquired, which allows them to transform the world they live in, fulfilling themselves as an individual in society. Contemporarily, according to Guerra and Cosenza (2011, p. 141), it is known that human behaviors originate in the nervous system and mental functions are associated with the functioning brain.

Regarding education, Guerra and Cosenza (2011, p. 141) state that when the educator understands brain functioning, their work becomes more meaningful and efficient, as it is possible to relate some neurobiological explanations with pedagogical subjects. Guerra and Cosenza (2011, p. 145) also state that the inclusion of topics related to neurosciences in the initial training of educators is an urgent challenge, as most educators have fundamentally humanistic training, essential for understanding education but insufficient, in this millennium, to meet the demands of learning for life in society.

Another challenge proposed by Guerra and Cosenza (2011, p. 145) involves proposing relevant topics to be studied, such as the functioning of the nervous system in learners with different brains, including in this case, knowledge that could integrate the training of special education teachers. Among learners with different brains, Soares, de Souza Arco-Verde, and Baibich (2004, p. 125) indicate that the special education of the gifted may seem controversial, as individuals with high abilities and giftedness are often seen as genetically privileged beings who do not need any type of assistance.

On the other hand, Soares et al. (2004, p. 125) evaluate that the role of the educator is fundamental for the student with high abilities and giftedness, so that they can perceive their talents and not see themselves just as different students. Soares et al. (2004, p. 126-127) also indicate that, in addition to the aforementioned controversy regarding special assistance for these students, their identification is also complex, involving more than just measuring intelligence through tests. In relation to behavior, the aforementioned authors also defend that the traits that separate gifted individuals from others are rarely perceived by teachers or the school's pedagogical team.

Thus, this work encompasses giftedness and neurosciences and aims to present a review that integrates giftedness and the neurosciences of behavior and cognition, potentially proving useful for special educators in the field of high abilities and giftedness. According to Lent (2004, p. 6), behavioral neuroscience: "...is dedicated to studying the neural structures that produce behaviors and other psychological phenomena such as sleep, sexual, emotional behaviors, and many others. It is sometimes also known as Psychophysiology or Psychobiology." According to Lent (2004, p. 6), cognitive neuroscience: "...deals with more complex mental capacities, usually typical of humans, such as language, self-awareness, memory, etc. It can also be called Neuropsychology."

As a starting point, considering the concepts of giftedness presented by various theories, including primarily ideas about the supposed peculiarities of gifted individuals, the following question arises: "Does the cognitive and behavioral uniqueness of the gifted individual, defended since the early days of psychometrics, reflect the results of current neuroscientific research?"

The present article is justified by the fact that despite the aforementioned assistance to gifted students being controversial and their identification difficult, recalling Soares et al. (2004, p. 126-127), on the other hand, Resolution No. 4 of Brazil (2009) establishes operational guidelines for Specialized Educational Assistance in basic education, special education modality. Thus, it is observed that the inclusion of gifted students is mandatory, as pointed out by Article 1 (Brazil, 2009, p. 1), stating that for the implementation of Decree No. 6.571/2008, the education systems must enroll, in regular education classes and in AEE, students with disabilities, global developmental disorders, and high abilities/giftedness.

METHODOLOGY / MATERIALS AND METHODS

The methodology used in the development of this work was a narrative review, based on the definition of Sallum, Garcia, and Sanches (2012, p. 151):

> Narrative reviews are broad publications suitable for describing and discussing the development or "state of the art" of a particular subject, from a theoretical or contextual point of view. They consist mainly of analyzing literature published in books, printed or electronic journal articles, and the author's personal critical interpretation and analysis. This category of articles plays a fundamental role in continuing education, as they allow the reader to acquire and update knowledge on a specific topic in a short period of time. (SALLUM, GARCIA E

SANCHES, 2012, p.151)

Through the aforementioned methodology, by means of a review of psychometric concepts, through Mäder (1996), Ramos (2007), Tyler (1966), Renzulli and Reis (1997), and Antipoff (1999); the article presents a counterpoint, resorting to neurosciences, through Lutzenberger et al. (1992), Almeida et al. (2010), and Shearer and Gaesser (2015).

RESULTS

To understand the concept of giftedness, it is necessary to seek the conceptual origins of this theory, related to IQ (intelligence quotient) tests and the advent of psychometrics. According to Mäder (1996, v. 16, p. 13), Ramos (2007, p. 11), and Tyler (1966, p. 61-62), IQ tests emerged after the advent of psychometrics. The history of this branch of psychology originated shortly before the beginning of the 20th century, when psychologists began their efforts to measure human intelligence; however, they lacked a precise idea about the nature of this quality. These efforts were more prolonged and intense than any other project involving psychological measurement. To achieve this, through quantitative assessment of an individual's psychological traits and attributes, psychometrics began to develop.

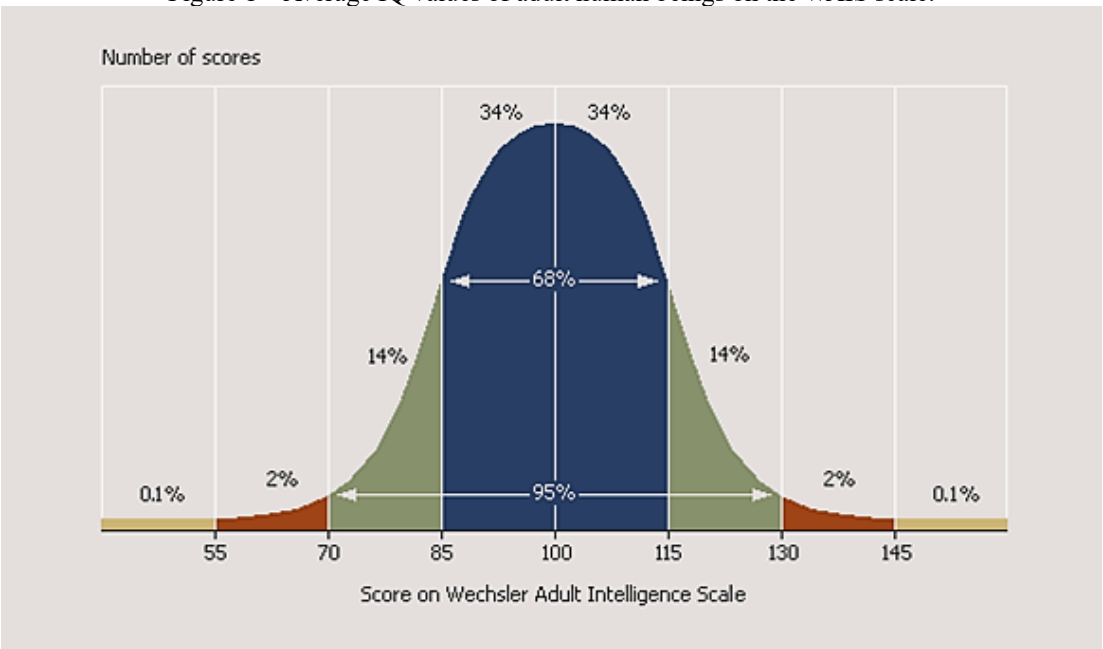
During the aforementioned period, according to Mäder (1996, v. 16, p. 14), it was in France that the basic principles for a psychometric assessment battery were established. The Binet-Simon Intelligence Scale was published in 1905 and was considered the first practical intelligence test. For the conception of the scale, which aimed to grade mental retardation, mental age and cognitive development concerning the biological age of the tested individual were considered. Mäder (1996, v. 16, p. 14-15) states that the Americans had great interest in the work of the French, and in 1908, Goddard standardized the Binet-Simon Scale for 2000 American children. In 1916, the aforementioned scale was revised by Terman, who adopted the concept of "Intelligence Quotient."

According to Mäder (1996, v. 16, p. 15), in 1936, David Wechsler published the Wechsler Bellevue Scale, marking the beginning of a series of intelligence assessment batteries, structured into two large groups of tests, verbal and non-verbal, called performance or execution; this structure remains in all batteries, for all ages, still used today. Among the Wechsler scales, the Wechsler Adult Intelligence Scale (WAIS), published in 1955 and revised (WAIS R) in 1981, covers the age range from 16 to 74 years.

The Specialedonthebellcurve website presents numerical IQ values obtained on the Wechsler Adult Intelligence Scale (WAIS), comparing the values obtained among adult human beings (Figure 1). It is observed that the average score is between 85 and 115; this means that most people are classified within this corresponding range, and that is why the top of the bell curve is over these scores. On the WAIS scale, while a score above 130 indicates high cognitive ability (giftedness), a

score below 70 indicates low cognitive ability (mild intellectual disability). However, the website informs that the actual criteria for identifying giftedness depend on the reference used.

Figure 1 – Average IQ values of adult human beings on the WAIS scale.



Source: Specialedonthebellcurve, 2024.

Contrasting the value of IQ tests as predictors of success, Tyler (1966, p. 75-76) already stated that there are several qualities not measurable by IQ tests. For example, children considered "gifted" may not achieve special talents in art, music, mechanics, or human relations. Therefore, the results obtained in the aforementioned IQ tests do not successfully predict an individual's adaptability (or lack thereof) to new situations.

Regarding intellectual development in terms of giftedness, it is worth mentioning Renzulli and Reis (1997, p. 73) apud Brasil (2007, p. 1); the authors make a distinction between being gifted and being able to develop gifted behaviors, which can be developed by some people at certain times and under certain circumstances. These behaviors and characteristics are presented by Antipoff (1999, p. 155-157).

The characteristics involving the social conduct of the gifted, in Antipoff's view (1999, p. 155), involve the fact that these individuals are entrepreneurs of social and constructive activities, enduring difficult situations with intelligence and good humor. These individuals are governed by the following behaviors: in childhood, they create a greater number of imaginary friends; when young, they tend to be playful and approach older people; they are sensitive, courteous, and cooperative; although not very willing, they easily relate to others; they aspire to freedom to perform their tasks; they entertain themselves alone; they prefer games governed by rules or systems.

In the school environment, according to Antipoff (1999, p. 156), the gifted student rejects repetition, prefers intellectual activities and individual work, shows independence and initiative, approaches older individuals, prefers cultured teachers, and avoids following orders.

Even concerning brain functioning, a differentiated behavior is observed regarding the brains of the gifted compared to those of individuals with average IQ, both in activity and at rest. This fact can be observed in Lutzenberger et al. (1992, p. 10-14), where the authors present a study whose objective was to determine the dimensional complexity of the electroencephalogram (EEG) concerning intelligence levels in humans. In two experiments, 34 male individuals were divided into two groups, with high and low intelligence levels (measured by IQ). During a resting phase and various mental imagery conditions, the EEG was recorded at several scalp locations.

According to Lutzenberger et al. (1992, p. 10-14), through non-linear analysis based on the theory of deterministic chaos, it was revealed that individuals with high IQ demonstrate greater dimensional complexity of EEG attractors than individuals with low IQ, but only during resting conditions; during the performance of imagery tasks, less intelligent individuals increase brain electrical complexity in such a way that, in this experiment, the differences between low and high IQ values disappear.

Regarding the terminology gifted, in Antipoff (1999), it is observed that the author uses various expressions to refer to the gifted, such as "well-endowed" or "talented." According to Antipoff (1999, p. 111), as a speaker at the 1st National Seminar in Brasília in 1971, Helena Antipoff preferred to adopt the nomenclature "well-endowed" to refer to the gifted; this term was better accepted, including by the talented individual, who felt less pressured by society.

As for the concept of well-endowed, according to Antipoff (1999, p. 111), in the conception provided by CENESP, based on J. Gallagher's studies, gifted children were considered those who presented remarkable performance and/or potential, either in isolation or combined, in the following aspects: general intellectual ability, specific academic aptitude, creative or productive thinking, leadership ability, special talent for the arts, and psychomotor ability. It is worth mentioning that the conception provided by CENESP, created in 1971, is still practically the same used today, as seen in Brasil (2007, p. 1) and Brasil (2009, p. 1).

Returning to the Three-Ring Conception, according to Renzulli and Reis (1997, p. 73) apud Brasil (2007, p. 1), creativity is presented as an ability not exclusively related to the artistic field but to any area of the student's interest. Thus, it is believed that the development of creativity and motivation, within the areas of interest and/or abilities of the student, extends the perspectives on the student's success and satisfaction.

The Three-Ring Conception (Figure 2), proposed by Renzulli and Reis (1997), was purposefully designed for a programming model that provides both academic development and high

achievement and creativity. In this model, the intersection of three items leads to giftedness, and they are: above-average ability, but not necessarily superior, as measured by cognitive ability and achievement tests; task commitment (motivation); creativity and its relationship with general and specific areas of human performance.

Figure 2 – The Three-Ring Conception.



Source: Own authorship, 2024.

However, in the view of the Ministry of Education, presented by Brazil (2001, p. 39), students with high abilities/giftedness are those who:

> … have great learning ease that leads them to quickly master concepts, procedures, and attitudes and who, having the ability to deepen and enrich these contents, should receive supplementary challenges in common class, in resource room, or other spaces defined by education systems, including to complete, in less time, the series or school stage. (BRASIL, 2001, p.39)

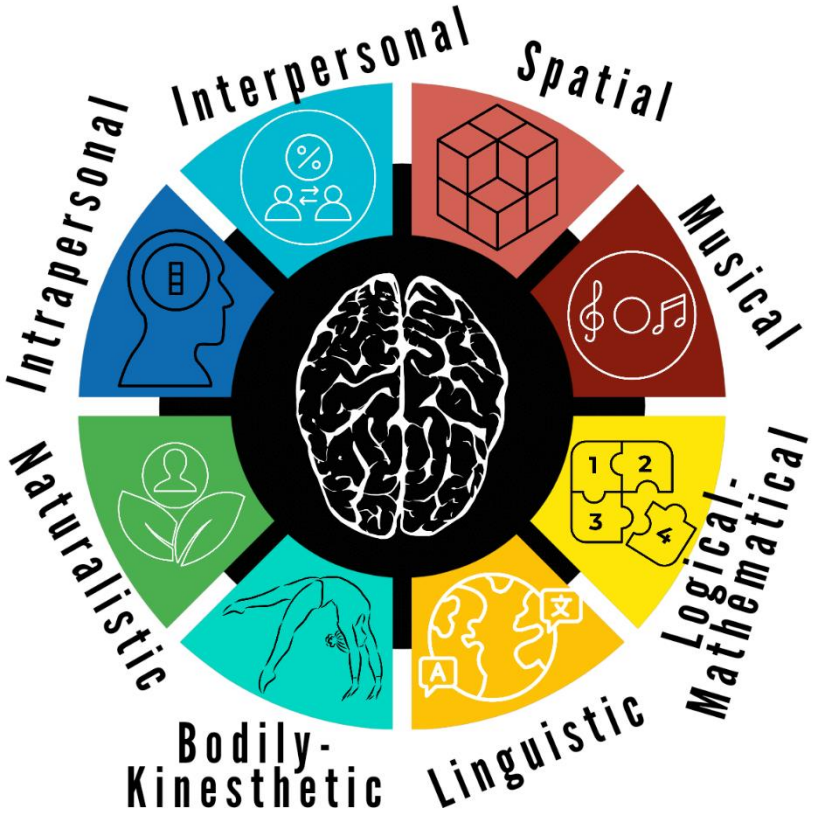
According to Brasil (2007, p. 1), gifted and talented children are those who present extraordinary performance, either in isolation or combined, concerning the following aspects: general intellectual ability, specific academic aptitude, creative or productive thinking, leadership ability, special talent for the arts, and psychomotor ability. These aspects resemble the theory of multiple intelligences proposed by Gardner (1995).

Gardner (1995, p. 22-29) presents what he calls "the seven intelligences," which are: musical, bodily-kinesthetic, logical-mathematical, linguistic, spatial, interpersonal, and intrapersonal. Gardner (1995, p. 46) also mentions a reasonable candidate for the eighth intelligence: moral or spiritual intelligence. However, the author states that this intelligence could be considered an amalgamation of interpersonal and intrapersonal intelligences.

A few years later, according to Sodré (2006), presented by Gama (2014, v. 27, p. 668), Gardner identified and recognized naturalistic intelligence. This intelligence can be summarized as

follows, according to Gama (2014, v. 27, p. 669): "...ability to recognize flora and fauna, to make distinctions and to act productively in the natural world. This intelligence characterizes people like Darwin." However, according to Gardner (1995, p. 45-46), if every capacity found in humans were considered an intelligence, there could be up to "seven hundred" intelligences. Therefore, the search for a smaller number of intelligences was deliberate (Figure 3).

Figure 3 – Eight intelligences identified by Gardner.



Source: Own authorship, 2024.

In the realm of multiple intelligences, according to Almeida et al. (2010, p. 225-230), new and more contextualized cognitive tests are suggested as alternatives to more traditional psychometric tests. The objective of this article was to examine whether these two types of instruments converge or not in a general factor of cognitive performance, conducted through the application of two tests in 294 children aged 5 to 7 years: General and Differential Aptitudes Battery (BADyG - reasoning, memory, verbal aptitude, numerical aptitude, and spatial aptitude), a test for assessing Gardner's multiple intelligences (integrating: linguistic, logical, visual/spatial, physical-kinesthetic, naturalistic, and musical). After the results, the authors state that there is relative independence between Gardner's multiple intelligences test and classic intelligence tests, so that both are not mutually exclusive. The authors also suggest that the tests converge on a single factor, suggesting that the general dimension of intelligence is an undeniable reality and somewhat corroborates Sternberg's theories (1994), in which the theory of multiple intelligences resembles.

Shearer and Gaesser (2015, p. 96-131) conducted an investigation reviewing 318 neuroscience reports to conclude that there is strong evidence, regarding multiple intelligences, that each intelligence has neural coherence. The investigation revealed a wealth of neuroscientific evidence describing the neural foundations of abilities associated with both general intelligence and the eight multiple intelligences. The description of the incompatibility between theories involving general intelligence and multiple intelligences seems to arise from a cultural preference, incompatible with the conclusions derived from neuroscientific evidence. According to the authors, perhaps the greatest challenge is creating a bridge between IQ and multiple intelligences, so that the "art of teaching" can also be improved, allowing all students to develop both academically and in other abilities.

DISCUSSION

What is simplistically named neuroscience is actually neurosciences due to the multiplicity of approaches, whose boundary between their disciplines is not clear due to the interdisciplinarity among their areas. Professionals dealing with neurosciences have their training in biology, biomedical sciences, or health sciences colleges; however, other professionals have shown interest in studying the nervous system, such as educators, who are interested in understanding how the nervous system handles learning processes.

Considering that most educators have fundamentally humanistic training, it is understood that this is sufficient to understand the theoretical foundations of education, but contemporarily, insufficient to meet the demands of learning for life in society. It is suggested then the inclusion of topics related to neurosciences in the initial training of educators. It is worth remembering that an educator who ventures into neurosciences and learns about brain functioning begins to exercise their work more meaningfully and efficiently, as they relate some neuroscientific explanations with pedagogical subjects.

To facilitate the teaching-learning process of individuals with different brains, it is necessary that the functioning of their nervous system is understood by their educators, making this process more efficient and effective. However, in the case of individuals with high abilities and giftedness, there is a certain controversy, as it is mistakenly believed that these genetically privileged beings do not need any type of assistance, which is fundamental for them to perceive their talents and not see themselves just as different.

Identifying gifted students is a complex task, considering that high abilities and giftedness go beyond measuring intelligence through tests. However, authors Soares et al. (2004) and Antipoff (1999) argue that there are traits that differentiate so-called normal individuals from gifted individuals. Within this context, Renzulli and Reis (1997) present a model with three variables that,

if met, could lead an individual, for a certain time and under certain circumstances, to exhibit gifted behaviors, reinforcing the aforementioned difficulty of identifying these individuals.

Recalling Gardner (1995) in the sense that humans possess multiple intelligences, new and more contextualized cognitive tests are suggested as alternatives to more traditional psychometric tests, and it is in this context that Almeida et al. (2010) examine whether these two types of instruments converge or not in a general cognitive performance factor. Although this possibility of convergence in which the authors believe is not excluded, it is observed that there is relative independence between Gardner's multiple intelligences test and classic intelligence tests, so that both are not mutually exclusive.

Shearer and Gaesser (2015) review 318 neuroscience reports to conclude that there is strong evidence, regarding multiple intelligences, that each intelligence has neural coherence. The authors present a wealth of neuroscientific evidence describing the neural foundations of abilities associated with both general intelligence and the eight multiple intelligences.

The description of the incompatibility between theories involving general intelligence and multiple intelligences seems to arise from a cultural preference, incompatible with the conclusions derived from neuroscientific evidence, as in Almeida et al. (2010) and Shearer and Gaesser (2015). The aforementioned authors believe that general intelligence and multiple intelligences tests converge on a single factor, thus, through future studies, there is the possibility of creating a bridge between IQ and multiple intelligences.

Regarding the psychobiology of gifted brains, Lutzenberger et al. (1992) reveal that individuals with high IQ, through an experiment using electroencephalogram, demonstrate greater dimensional complexity in brain functioning when at rest, compared to individuals with lower IQ. However, the differences in EEG results practically disappear when individuals, with low or high IQ, perform imagery tasks.

The analysis of Lutzenberger et al. (1992) raises the question of the possibility of biological differences between a gifted individual and an individual with an average IQ. Based on the aforementioned Lutzenberger et al. (1992) and Renzulli and Reis (1997) and their concept regarding the existence of individuals who exhibit gifted behaviors, this present article points to the need for Lutzenberger's experiment to be repeated with two clinically tested groups: non-gifted individuals who exhibit gifted behaviors and gifted individuals, to determine whether in this case, biological differences will reflect in divergent results or if gifted behaviors (between gifted and non-gifted individuals) will ensure parity between the results of the two tested groups.

FINAL CONSIDERATIONS

Integrated educational methods play a crucial role in understanding and promoting adequate education for students with High Abilities/Giftedness (HA/G). While giftedness is often associated with high general intellectual potential, typically identified by the numerical value of IQ (Intelligence Quotient), high abilities are characterized by more subjective and complex identification criteria, referring to exceptional capacities in specific areas. The combination of neuroscience with pedagogy promises more personalized and in-depth teaching, capable of meeting the distinct needs of these two groups.

The integration of neuroscientific knowledge into the education of students with HA/G is a vital strategy, recognizing that exceptional capacities transcend what is measurable by conventional IQ tests, encompassing a wide range of cognitive and behavioral complexities. Therefore, the article highlights the importance of holistic educational approaches for both high abilities and giftedness, which should support the social and academic development of these individuals.

FUTURE STUDIES

Based on the analyses and discussions presented in this article, several directions for future research can be suggested to deepen the understanding of giftedness and high abilities from a neuroscientific and educational perspective.

REPLICATION OF LUTZENBERGER'S EXPERIMENT

The analysis of Lutzenberger et al. (1992) raises the question of the possibility of biological differences between gifted individuals and those with average IQ. Based on the results of Lutzenberger et al. (1992) and the concepts of Renzulli and Reis (1997) regarding the existence of individuals who exhibit gifted behaviors, this article points to the need to replicate Lutzenberger's experiment with two clinically tested groups: non-gifted individuals who exhibit gifted behaviors and gifted individuals. This study would help determine whether, in this case, biological differences will be reflected in divergent results or if gifted behaviors (between gifted and non-gifted individuals) will ensure parity between the results of the two tested groups.

LONGITUDINAL INVESTIGATION OF GIFTED BEHAVIORS

Another area of interest would be conducting longitudinal studies that follow individuals with gifted behaviors over time. These studies could provide insights into how these behaviors develop and manifest at different stages of life, as well as the conditions that may favor or inhibit their development.

INTEGRATION OF NEW COGNITIVE TESTS

As discussed by Almeida et al. (2010), there is relative independence between Gardner's multiple intelligences tests and classic intelligence tests. Future studies could investigate the integration of these new cognitive tests into the process of identifying gifted individuals, examining how these different measures can complement each other and provide a more holistic assessment of cognitive abilities.

IMPACT OF PERSONALIZED EDUCATION ON HIGH ABILITIES

Based on the proposals of Guerra and Cosenza (2011) and the guidelines of Brazil (2009), it would be valuable to investigate the impact of personalized educational programs that incorporate neuroscientific knowledge on the development of students with high abilities and giftedness. Studies could focus on how these personalized approaches influence academic performance and the socio-emotional development of these students.

COMPARATIVE STUDIES BETWEEN DIFFERENT MODELS OF GIFTEDNESS

Finally, it would be interesting to conduct comparative studies between different models of giftedness, such as Renzulli's Three-Ring Conception and other models based on IQ or multiple intelligences. These studies could clarify the advantages and limitations of each model and provide recommendations for educational practices and public policies.

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Reflections on mental health as a political agenda in Brazil: From the process of enclosure to the restructuring of national policy

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Jorge Luiz Rubbo Abdo[1], Sylvain René[2], Larissa Helena Sacheto Abdo[3], Temístocles Damasceno Silva[4], Ismar Eduardo Martini Filho[5], Alba Benemérita Alves Vilela[6] and Sérgio Donha Yarid[7]

ABSTRACT

The present critical theoretical study aimed to reflect on the process of restructuring mental health in Brazil. As a methodology, the development of a study of theoretical reflection was outlined, with the perspective of discussing the phenomenon of the Brazilian psychiatric reform, taking into account the studies related to the theme, and that would dialogue about such scientific knowledge. The process of psychiatric reform, which began in the 90s, aimed to combat imprisonment through the deinstitutionalization of individuals with a clinical diagnosis of mental illnesses, in the search to bring back to society, as citizens, individuals with mental illnesses, as well as to restructure the psychiatric health model in the country. Such dynamics were based on the ideals of humanization. The expansion of the Psychosocial Care Centers, and consequently, the decrease in the percentage of beds in psychiatric hospitals, accompanied by changes in the labor process, are presented as consequences of this process.

Keywords: Psychiatric Reform, Mental Health Policy, Psychosocial Care, Deinstitutionalization, Mental Health Care.

[1] Master's student in Nursing and Health
Educational institution: Faculty of Medical Sciences of Santa Casa de São Paulo
E-mail: jorgeabdo@uesb.edu.br
ORCID: https://orcid.org/ 0009-0002-8080-9223
[2] Doctor student in Nursing and Health
Training institution: Haiti University of Technology (UNITH-HAITI)
E-mail: sylvainrene04@gmail.com
ORCID: https://orcid.org/ 0000-0003-0562-7083
[3] Medical Student
Training institution: Anhembi Morumbi University (UAM)
E-mail: abdolarissa3@gmail.com
ORCID: https://orcid.org/0000-0001-5057-5679
[4] Doctor in Physical Education
Training institution: State University of Southwest Bahia (UESB)
E-mail: tom@uesb.edu.br
ORCID: https://orcid.org/0000-0001-5932-9773
[5] Doctor of Forensic Dentistry
Educational institution: University of Uberaba – SP
E-mail: iemfilho@uesb.edu.br
ORCID: https://orcid.org/0000-0002-1013-6951
[6] Doctor in Nursing
Educational institution: Federal University of Sergipe
E-mail: albavilela@gmail.com
ORCID: https://orcid.org/0000-0003-2110-1751
[7] Doctor in Preventive and Social Dentistry
Educational institution: University of Uberaba – SP
E-mail: yarid@uesb.edu.br
ORCID: https://orcid.org/0000-0002-6447-0453

INTRODUCTION

State attention to mental health in Brazil is relatively recent, dating back to the beginning of the nineteenth century, when the royal family established the first assistance measures (Fonte, 2012). In this period, the approach was far from humanization, focusing on the removal of the mentally ill from society rather than their well-being. Considered maladequate, they represented a threat to public order in a phase of national consolidation. Thus, the treatment based on confinement was adopted, aiming solely to maintain order, rather than to promote the recovery and inclusion of affected individuals.

More than twenty years later, advocates of a reform in the psychiatric care model fought for what they believed to be the rescue of the dignity and citizenship of people with some type of mental suffering. Thus, they demanded the end of psychiatric hospitalizations in Brazil, a procedure shrouded by contradictions and denunciations of abuse and violations. Although the approved text, unlike the original proposition, did not guide the extinction of these institutions, it nevertheless constituted a new model of treatment for the issue of mental health in the Brazilian territory (Amarante, 1998).

Thus, Law 10.216, enacted on April 6, 2001, marked a historic milestone in the National Mental Health Policy (PNSM) in Brazil, ending a long struggle for a reform in the psychiatric care model (Brasil, 2001; Amarante, 2007; Yasui, 2010; Amarante; Nunes, 2018). Advocates sought to rescue the dignity and citizenship of people with mental disorders, demanding an end to psychiatric hospitalizations due to reports of abuse. Although the law did not eliminate such hospitalizations, it introduced a new treatment model focusing on resources outside hospitals and guaranteed rights to those suffering from mental disorders. This achievement was celebrated by those involved and marked a new phase in the National Mental Health Policy (Amarante, 1998).

Therefore, considering the relevance of the subject and the connection of these researchers to the health area, inserted in the field of public health policies in the country, the present study aimed to develop reflections related to the process of restructuring mental health in Brazil.

INTERNATIONAL POSITIONS ON MENTAL HEALTH AND DEVELOPMENTS IN THE NATIONAL CONTEXT

The consequences of World War II caused major changes in human relations and, consequently, provoked various positions of governmental and non-governmental entities. Among these, the United Nations Organization stands out based on the creation of the Declaration of Human Rights in 1948.

According to Vasconcelos, 1992, this process has driven changes in the perceptions of treatment for people with mental disorders. New paradigms for understanding mental illnesses have

emerged, moving away from the biomedical model focused only on the disease, its symptoms, medications, and hospitalization, to an approach guided by the preventive and community mental health care model**.**

By contextualizing mental health in Brazil, it is possible to verify that this agenda is characterized by disparities in care models. Variations in understandings of madness and mental illness influenced the formation of various care practices. The socio-political and economic context, and the organization of the health system also contributed to the change in institutions and their approaches.

The initial milestone of cloistered care took place in Rio de Janeiro, from the emergence of the Pedro II Hospice in 1841. The idea was to remove from social coexistence those who symbolized intimidation of society, based on hygienist assumptions and private freedom. In this period, the existing asylums had religious and charitable characteristics. As a result, the Pedro II Hospice began to be governed by scientific psychiatry, expanding the medicalizing approach after the Proclamation of the Republic (Messas, 2008; Yasui, 2010).

Although the Psychiatric Reform in Brazil emerged concomitantly with the health movement in the 70s[8], its events presented a singularity that is inserted in the international context of overcoming violence in psychiatric hospitals, in addition to the approval of new laws and norms, as well as changes in government policies and health services (Brasil, 2002).

The Regional Conference for the Restructuring of Psychiatric Care, organized by the Pan American Health Organization, in Caracas, Venezuela, from November 11 to 14, 1990, endorsed the need to review the care related to patients with mental disorders. This event recognized the social incapacity of the asylum based on four axes: ethical-legal, clinical, institutional and sanitary. Therefore, the unfavorable conditions for the human and civil rights of patients were evidenced, as well as inadequate care for the mental health needs of the population and health services.

This event made it possible to create a document with the objective of protecting people with mental problems and improving mental health support. This document emphasized the right to consent for treatment, a significant advance in the relationship between health professionals and health service users. Consequently, Brazil adopted these premises through the Mental Health Coordination of the Ministry of Health (PAHO, 1990; Brazil, 2002).

The Paulo Delgado Law sanctioned in 2001, after 12 years of discussion in the National Congress, changed the way mental health care was offered, prioritizing treatment in community services and protecting the rights of people with mental disorders. However, the law did not establish a clear plan to extinguish asylums. The disclosure of Law 10.216 boosted the reform movement in

1. This movement aimed at transformations in management and in the models of care in the field of health, defense of collective health, equality in the supply of services and greater participation of workers and users in the management and production of care technologies (Brasil, 2001).

our country. In the midst of this, the state developed a mental health policy in line with the guidelines of the RPB, creating specific lines of financing for services to be developed to replace the psychiatric hospital.

In the meantime, the III National Conference on Mental Health was created in 2001, which was fundamentally important for the implementation of these changes, as it promoted a dialogue between different actors involved in the sector, including all participating audiences, such as users, family members, health professionals and managers. This broad participation, from managers to users of the system, was essential for the formulation of more inclusive and effective public policies (Brasil, 2001).

According to data from the Ministry of Health, there was an expansion of the mental health care network through care in regions where community mental health care was practically non-existent. The creation of the "Back Home" Program presents itself as a government attempt to deinstitutionalize people who have been hospitalized for a long time. At the same time, a human resources policy linked to the Psychiatric Reform and another to deal with alcohol and drugs was created, including the harm reduction strategy. Subsequently, the first Psychosocial Care Center (CAPS) was started in São Paulo, bringing together about two thousand professionals and patients from the CAPS (Brasil, 2005).

According to Costa-Rosa, 2003, the paradigm of psychosocial care gained materiality through the CAPS in view of the theoretical, technical, ideological and ethical elements to oppose the care model historically constructed by the psychiatric paradigm. Data from the Federal Government indicate the existence of 1,000 CAPS units in 2006. In addition, the amount of financial resources allocated to community services exceeded the amount of what was performed by psychiatric hospitals (Brasil, 2006). In view of the above, it is observed that the RPB created and expanded the number of CAPS in the country.

The restructuring and expansion of the CAPS was highlighted, causing access to the creation of different modalities of care, such as: CAPS-AD (alcohol and drugs), CAPS-II (for more severe cases) and CAPS-AJ (for child and youth care), among others. Thus, these centers were designed with the aim of offering not only an alternative to the hospital model, but also providing a more humane and favorable environment for the recovery and social reintegration of patients into the community (Brasil, 2005). It is worth noting the significant reduction in the number of beds allocated to psychiatry after the BPR after 2008. For Fernandes, 2018, this process brought about the increase in new strategies for care in the community, autonomy and citizenship for individuals in mental suffering.

In 2008, the Family Health Support Centers (NASFs) were designated, with the premise of mental health support for the Family Health Strategy (ESF) teams. That same year, the health

conference was established to provide support to the NASFs, being characterized by advocating for a fairer and more welcoming society, bringing better living conditions to citizens facing mental suffering, integrating the struggle for social equity with the promotion of the psychological well-being of individuals (Andrade and Maluf, 2017; Delgado, 2019).

The reintegration of people with long histories of hospitalization into social life, as well as the reduction of beds in psychiatric hospitals, became a public policy in Brazil from the 90s onwards, gaining momentum in 2002 with norms from the Ministry of Health that established clear, effective and safe mechanisms to reduce the number of beds in these hospitals.

However, in order to assess the pace of this reduction throughout the country, it is necessary to consider the history of implementation of psychiatric hospitals in the states, as well as the adoption of the guidelines of the Psychiatric Reform in each region, since the process of reintegration presupposes cultural and subjective transformations in society, always depending on the cooperation between the three governmental waits. (Brazil, 2005).

THE HOSPITAL SYSTEM FOR PSYCHIATRY

The National Program for the Evaluation of the Hospital System for Psychiatry (PNASHP) is a crucial management instrument for the gradual reduction and closure, planned and agreed, of beds in psychiatric hospitals in Brazil. Established in 2002 by the Ministry of Health, the PNASHP allows managers to assess the quality of care provided by psychiatric hospitals and public hospitals, providing them with criteria for hospital psychiatric care compatible with the standards of the Unified Health System (SUS). This systematic and annual evaluation process also makes it possible to de-accredit hospitals that do not meet the established quality standards (Brasil, 2002).

Prior to the PNASHP, the systems for control and evaluation of these hospitals intended for psychiatry were restricted, based on hospital supervisions carried out by supervisors of the Unified Health System and on inspections or audits motivated by complaints of malfunction of the units. The implementation of the PNASHP by introducing a comprehensive and periodic evaluation system was fundamental in the process of reorganizing mental health in Brazil. Health now follows a systematic and annual process, carried out by professionals from three complementary areas: the clinic, health surveillance and regulation. This integrated work aims to ensure the quality and safety of health services (Brasil, 2005).

However, psychiatric reform is a complex and multifaceted process that seeks to systematize the Brazilian mental health model, promoting deinstitutionalization and socially including these people who were previously banned from living in the community, because they were mentally ill. One of the pillars of this reform is the idea of deinstitutionalization, which implies not only the closure of asylums, but also the creation of a network of mental health services that offer

comprehensive and comprehensive care, based on the community and the territories where people live. intervention (Rotelli, Leonardis and Mauri, 1990).

Of equal importance, negotiation and agreement between the different management levels, Community Health Councils, and mental health service providers are essential for the effective implementation of the BPR. Understanding with this, that the reform requires an integrated and coordinated approach, which involves the process of transferring resources destined for this purpose. Aiming at respect in the definition of public policies, in the creation of alternative services to asylums and the guarantee of the rights of users of the mental health system. (Deviation, 2015).

The bipartite and tripartite inter-management committees are important spaces for the negotiation and agreement of policies and actions related to the Psychiatric Reform. In these spaces, representatives of the different levels of government and civil society meet to discuss and define strategies, resource allocation and goals to be achieved in the field of health.

The participation of Community Health Councils is crucial, as they represent the voice of the community and can contribute to the formulation of policies that are more appropriate to local needs and that promote the inclusion and participation of users of the mental health system in the decision-making process.

Thus, the RPB is part of a process that requires joint work and articulation between different actors, with the objective of ensuring that people with mental illnesses have access to quality services, based on the community and that respect their rights and dignity, understanding that its main objective is based on the deinstitutionalization of people with mental disorders, with emphasis on those that have been cloistered for a long time.

For each significant reduction in these hospitalization beds, it is necessary to expand the mental health care network based on the needs of each community, this implies knowing how to implement specific actions for the social reintegration of individuals with a history of prolonged hospitalization, as well as implementing strategies such as therapeutic residences and adherence to the Back Home Program (Brazil, 2005).

In this way, it is valid to express that these advances reflect a paradigm shift in the way Brazilian society sees and treats mental health, valuing the humanization of care, the autonomy of individuals and their insertion in the community. The Brazilian Psychiatric Reform continues to be a process in constant evolution, facing challenges and seeking continuous improvements in the care of people who experience mental health problems (Brasil, 2005).

However, the trajectory of the transformation of psychiatric care in our country continues irregularly, with advances and setbacks, not forgetting to mention the tensions in the disputes for power in the nation. Despite the challenges, several studies show that this reform has achieved significant progress, with emphasis on the replacement of hospital care by the expansion of the

community network, even if gradually (Amarante and Nunes, 2018; Clementino *et al*., 2019; Lima, 2018; Onocko-Campos *et al*., 2018).

Notably, the transition period from institutionalized care to the community environment caused a significant increase in the transfer of financial resources to extra-hospital services. The psychiatric reform has experienced significant advances since its creation, although still scarce, in the intensification of its services.

However, the social stigmatization of individuals in mental suffering or with needs resulting from the use of psychoactive substances is still a reality to be overcome, despite the advances with psychiatric reform. Likewise, the reproduction of bureaucratized and rooted practices, as well as the scarce intra- and extra-sectoral junction, are aspects to be faced for the best effectiveness of the reform process.

FINAL CONSIDERATIONS

In view of the above, the advance in mental health policy in Brazil occurred with the implementation of the Psychosocial Care Centers, in the search to replace the hospital-centered model that previously existed. However, there are still assumptions to be overcome, such as the obligation of more investments in research to prove the effectiveness of this model, the training of professionals, the strengthening of intersectoriality and the expansion of the service network.

Thus, the historical stigma in relation to people with mental disorders is a barrier to be faced. This leads to highlighting the importance of addressing these issues to solidify the change in the mental health care model throughout the Brazilian nation. Stabilizing the new services with the traditional model of hospital care is inevitably a challenge to be faced.

Despite the advances with the creation of the Psychosocial Care Centers (CAPS III), which are today the only services effectively focused on the care of patients in crisis, replacing psychiatric hospitals, it is perceived that the vision of comprehensive hospitalization is still seen as a solution to family tensions. Therefore, training and involving family caregivers is essential to consolidate the new care model.

However, a recapitulation of the trajectory of the institutionalization of mental health in Brazil shows that accepting the coexistence of asylums and therapeutic communities with substitutive services contests the principles and objectives of the Brazilian Psychiatric Reform, referring to the model of segregation, incarceration and prejudice. The justification for psychiatric reform is the defense of the right to citizenship and a more equal society, allowing those facing mental health challenges to have their voice and suffering recognized and addressed.

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Endless prisons

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Josean Roberto Pires Cirqueira[1]

ABSTRACT

The text addresses the complexity of freedom and prison from a philosophical and reflective perspective. Although each individual perceives himself as free, in fact he is always imprisoned by different concepts and conditions imposed by society and by his own mind. The prison metaphor unfolds in several layers: when freeing oneself from one, one often finds oneself imprisoned in another, perpetuating a cycle of escapes and new imprisonments. As a result, lucidity about our condition as captives can be as illusory as it is liberating, because those who think they are free often impose their own prisons on others, without realizing that they are trapped in their own beliefs and ideas. The search for freedom can be an incessant search for new forms of imprisonment, where escaping from one reality only puts us in another prison, less noticeable at first glance. The reflection extends to political, social and religious life, suggesting that many aspects of society are structured as invisible prisons, where laws and norms function as bars that limit individual freedom. Death is seen as a point where all prisons dissolve, but it is also questioned as an idea that shapes our existence within the very prisons we create. However, the text challenges the traditional idea of freedom by suggesting that, even in the quest for emancipation, we may only be moving between different forms of confinement, without ever achieving true absolute freedom.

Keywords: Philosophy, Alienation, Prisons, Humanity, Infinity.

[1] Post-Graduate Student in Philosophy, Institution: Centro Universitário FAVENI
E-mail: joseanadvogado@hotmail.com

INTRODUCTION

SCIENTIFIC NOTE

Although each man is endowed with freedom, each being also permits himself to grant to each one opposed to himself a prison in which he is not incarcerated. In this deceptive thought, he makes himself a true freedman, a slave master who sees in his neighbor true slave quarters, captives of thoughts, alienated from the dawn. It does not seem to be a simplistic and individual thought, but a complex and collective one that, in the face of the prison that one allows oneself to be freed, is nothing but another prison that follows the first, a prisoner of infinite prisons. Freed from the previous prison, he finds himself a prisoner with new captives who look with disdain at the prisoners of the cell in which he had been. A false jailer, he does not imagine that he is in a prison guarded by guards who are supposed to be free, being observed by individuals who believe they have such a condition in the same way;

How do we know if the freedom that is available is nothing but a disguised prison? It is true that one makes oneself known, that the lucidity one proposes to possess is the purest escape from the various prisons, and that the more escapes undertaken, the more appearance of freedom one makes one believe. It is no less correct that if the first escapee from Plato's cave had persisted that he had entered another prison instead of coming out of one, he might have lived longer! It was not the desire to show the light instead of shadows that made him return, it was the lack of persistence in the next thought: the new imprisonment! What good was it to him to live in the light if he was alone? It was necessary to undertake more escapes from the world of caves, because solitary prisoners are more captives than prisoners. It is a fact that others have succeeded in this enterprise, of which they have become philosophers, who, by indoctrinating the world of light, have asserted not to remain alone.

Behold, the sun that illuminates is also illuminated and all lucidity that presents itself must have a subsequent lucidity that watches over it, like the apparent jailer to the prisoner who believes himself freed. The lucidity that he believes he possesses, because he believes he is not imprisoned, is the same that he imposes on his own in the form of a unique and absolute truth, of which as a good captive he diligently prepares the cell for his proselytes, who, convinced of freedom, willingly leave from one prison to another without realizing the same world from another perspective.

It is correct to say that incarcerated people who have the lucidity of their captive status are prisoners on the run, a prepared escape is a project of future prison. The arrests are successive and endless. Pondering a freedom and conceiving it for oneself is apparently the cruelest of all prisons, because it disarms the being to undertake new escapes, prevents him from the lucidity of new worlds, understood as new prisons, since to undertake new escapes is to increase the state of consciousness of reality, therefore his lucidity, but one perseveres since between remaining and moving it is the natural tendency of the one who reflects to set himself in motion.

As eternal captives, why make escapes? This question seems quite heartbreaking, since apparently it leads one to believe that the way out of one prison is to be imprisoned in another, infinite times. First, it is necessary to clarify that not everyone is willing to escape, since they are quite comfortable in their prison, with their cellmates thinking and acting like jailers, when in fact they are unaware of their status as a captive. Second, thinking about escape requires intellectual effort and the denial of prisonership. To escape from one prison to enter another requires constant elaboration of escape plans, and then it requires devoted elaborated thought. Each successful escape carries with it the experience of the previous prison, the more one escapes from one prison to another, the fewer cellmates one will have, the more lucid one will become. Prison overcrowding brings with it ununderstaken or unsuccessful escapes. The overpopulation of captive individuals demonstrates and reinforces the false idea of jailer of prisoners other than the Self. The longer one remains in a prison, the more illusory the state of not being in one seems, the more the state of remaining in the cell is consolidated. When one succeeds in an escape and finds oneself in another prison, it is certain that one is faced with fellow escapees who have undertaken the most diverse plans to find themselves there, yet we look at the cell next door and see the bars of the Others other than the Self. The prisoner who has begun the process of escape and succeeding in his endeavor generates a look of the Other's cell bars, which may suggest cell bars in himself. The thought of the Other's jailer awakens in himself the thought of a prisoner. Prisoner's condition of thought is preparation for escape.

This utopia that is called freedom is a pleasant perception of the prison itself, it is not in the absence of freedom that one makes oneself appear to be imprisoned, it is exactly in the condition of freedman that incarceration is stronger, it is in this thought of a jailer that the cell really fulfills its function. Prison begins from conception, birth does not free man, on the contrary it condemns him to be human, every act prior to conception comes from an act of a prisoner, generating descendants during the prison cell in which he is inserted. Death is not the liberator of prisons, death is not, and cannot be anything, there is nothing in death, because death has no power to be something, there are no ideas or thoughts in death, consequently death has no status of being, however, the idea of death shapes time, space and size of prisons. Religion that claims to transcend the idea of life, therefore the idea of prison, creates yet another prison within the incarceration itself, in which the jailer is placed as the freest of all beings, which being propagated in life does not resist death, but his own idea of death while still alive, in such a way as an invisible jailer with influence in prison establishments.

Man, before being a political animal, is a trapped animal, his predecessors were prisoners, his successors will also be prisoners. The laws that are the rules of how each prison must treat its prisoners and how each law, just as each inmate is also imprisoned in a cell, are, therefore, prisoners'

conducts legalized by a group of jailers who consider themselves free inside a prison, but are as captive as the laws they created. In this set of laws that perpetuate infinite prisons, there is a primordial principle to be followed, "that the best way to keep someone prisoner is to make sure that he never knows that he is in prison".

FINAL CONSIDERATIONS

Finally, it is demonstrated that we are facing successive prisons, where each one is free when in fact they are prisoners of the system itself.

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Proof of Stable Union for the purposes of social security benefit of pension for rural death

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Gilliane Oliveira Feitosa[1] and Arisson Carneiro Franco[2]

ABSTRACT

The Federal Constitution grants State protection to stable union, and civil marriage is no longer considered valid for the definition of family, because being the base family of society, stable union, is linked to this new family form. This article aims to demonstrate proof of stable union for the purposes of social security benefit of pension for rural death, showing the necessary requirements to obtain this type of benefit. Therefore, it was necessary to have a research methodology to ensure an updated perspective on the subject, a bibliographic and exploratory excerpt addressing the historicity of stable union in the differentiation of civil marriage, seeking authors' concepts on the subject, how it arose and what requirements were used to prove this social status, and how the right to the benefit of pension for rural death was clear. It is concluded that just as civil marriage is supported by law to guarantee a social security benefit of pension for rural death for the surviving spouse and child, people who live in a stable union are also in the same quality because it is clear that the criteria exist, as being a public, continuous and lasting union and that has the objective of family constitution.

Keywords: Family, Stable Union, Requirements, Social security benefit, Rural death pension benefit.

[1] Graduated in Bachelor's Degree in Administration from the State University of the Tocantina Region of Maranhão – UEMASUL (2017). Undergraduate student of the Bachelor of Laws course at the Institute of Higher Education of Southern Maranhão – IESMA/Unisulma.
E-mail: Gillianefeitosa@hotmail.com
[2] Advisor Professor. Social Security Lawyer. Graduated in Law from the Higher Education Unit of Southern Maranhão – UNISULMA. Master's degree in Social Relations Law from the University Center of the Federal District - UDF. Postgraduate in Civil Procedural Law from the Renato Saraiva Teaching Center – CERS. University Professor of the Law Course at IESMA / UNISULMA. Member of the William Beveridge Research Group.
E-mail: arisson.franco@hotmail.com

INTRODUCTION[3]

The stable union, according to the Civil Code, from articles 1,723 to 1,727, can be considered as a relationship in which there is a coexistence between a man and a woman, which is lasting and established with the purpose of establishing a family.

According to Law 8.213/1991, which regulates the main points on social security benefits. When a person is married, and their spouse dies, the right to a death pension from the National Institute of Social Security (INSS) is granted by the General Social Security Regime - RGPS. In the case of a stable union, however, will the death pension be guaranteed in the same way that it is guaranteed to spouses or children? To be entitled to the death pension, two requirements need to be met, they are: the deceased partner must be insured by the INSS at the time of death and must be characterized as a stable union at the time of death. In this case, same-sex couples can also be considered stable unions, if they are within the composition of a family entity, having the same rights as heterosexual couples. As evidence, in addition to the stable union signed in a notary's office through the public deed of stable union, there are other means for it to be recognized.

In view of this, this article has as its theme the Stable Union, which will seek to show how to prove it for the purposes of receiving a death pension, especially the special insured (rural worker/farmer). It proposes to answer the following problem: How does the recognition of the stable union contribute to the granting of a pension for rural death and the effectiveness of social justice?

For this reason, this article will show how it is possible to obtain the benefit of a rural death pension, complying with the necessary requirements, to which the dependents of the insured arising from death or presumed death are subjected. Seeking to answer the problem, following the general objective which is to analyze how the stable union has significantly influenced the scope of social security law, so that such requirements are fundamental or even indispensable to obtain the benefit of pension for death, if it did not constitute a civil marriage. In addition, the present research is linked to the specific objectives: to contextualize stable union in the legal provisions, to differentiate stable union from civil marriage, to highlight how stable union influences social security law, especially in the benefit of pension for rural death. delimit the requirements for granting the rural death pension benefit.

For this reason, this article will show how in fact a person who in his or her moment of mourning the loss of a loved one, may request the benefit of a death pension if he or she is within the necessary requirements, and being a way to assert his or her right, as a widower or companion as a partner.

[3] Article presented to the Bachelor's Degree in LAW at the Institute of Higher Education of Southern Maranhão – IESMA/Unisulma.

STABLE UNION IN BRAZIL AS A NEW FAMILY FORM

The Federal Constitution of 1988, in a special chapter, chapter VII of Title VIII – On Social Order, in which it addresses the family, children, adolescents and the elderly, and thus extracting from article 226 of the Magna Carta, says that the family is the result of the following institutes, civil marriage, stable union and the single-parent entity, but in addition to these there is an expansion of the concept of family, thus emerging new models, such as homoaffective family, anaparental family and eudaimonist family. Thus, we can say about family law that:

> Family Law is constituted, in essence, by rules of public order, related to personal or existential law. But there are also rules of a private nature, of a patrimonial nature. (...) Family Law has been undergoing profound structural transformations, in the face of new principles that are applicable to this legal branch, some of a constitutional nature. (SIMÃO and TARTUCE, 2010, p. 55)

The family is the basis of society, as it contributes to the development of the personality of its members, as well as to the growth and formation of society itself, thus justifying the protection of the State. In this way, we can say that the matrimonial family results from marriage and the informal family results from the stable union. Thus, Pedrotti (1990) says that "the concept of family, with the 1998 Federal Constitution, can no longer be considered only the original one of marriage." In this sense, the stable union is linked to the new form of family.

CONCEPT AND ITS HISTORICAL EVOLUTION

A Stable Union is the relationship between two people that is characterized as a public, continuous and lasting coexistence and that has the objective of establishing a family. Thus, also called free union, it has always been recognized as a legal fact, thus assuming a role of great relevance in Brazilian society, characterized as a family entity. For Venosa (2011), "A legal fact is any event that generates legal consequences. Stable union is a fact of man that, generating legal effects, becomes a legal fact."

In Brazil, the first recognition in which the partner could be a beneficiary of her partner to receive compensation on account of a case of work accident was through Decree-Law No. 7,036/1944. Gonçalves (2017) says that "for a long historical period, this family entity was recognized as concubinage, or "free union" because it defined the prolonged union between man and woman, without marriage, life in common, under the same roof, with the appearance of marriage." Soon after, with Law No. 6,015/73, it began to admit the possibility of the partner using the surname of her partner, article 57, § 2. And that the companions would also have the guarantee of claiming alimony claims, by the rite of Law No. 5,478/1968 (alimony law).

With the Magna Carta of 1988, family law was changed in its cultural principle, as it underwent significant changes in the contemporary family, abandoning models that excluded family

relationships not linked to marriage, thus causing absolute inclusion. And so it was recognized in its article 226, § 3, the stable union, in the following terms: "for the purpose of protection of the state, the stable union between a man and a woman is recognized as a family entity, and the law must facilitate its conversion into marriage". Thus, the Federal Constitution grants State protection to stable union.

In the past, the minimum length of cohabitation of 5 (five) years, the existence of children and cohabitation were necessary factors for the recognition of stable union, that is, they were indispensable factors for the characterization of this institute. These rules were applied through Law No. 8,971/1994, thus giving effectiveness to the constitutional provision.

But, in 1996, with Law No. 9,278 in its article 1: "The lasting, public and continuous coexistence of a man and a woman, established with the objective of establishing a family, is recognized as a family entity." With the enactment of this law, such requirements as the time lapse or the existing common offspring were waived. As well as with this law, movable and immovable property acquired during the stable union and for consideration, by one or both, belongs to both. And that the matter about stable union and the jurisdiction of the Family Courts:

> Determining Law No. 9,278/96 that the matter of stable union is the competence of the Family Courts, the diploma resolved a pending case present in several States of the Federation, in which the cases were sometimes assigned to civil courts, sometimes to specialized courts, with unnecessary conflicts and jurisdiction." (VENOSA, 2011, PAGE 52)

With the enactment of the Civil Code of 2002, Laws No. 8,971/1994 and 9,278/96 were repealed, as the title referring to stable union was inserted in five articles, from 1,723 to 1727, in which it brings the basic principles of the aforementioned laws. The legislation in force also does not establish a minimum period of cohabitation for a relationship to be considered a stable union. Gonçalves states that, "It is not, therefore, the time with the determination of the number of years that should characterize a relationship as a stable union, but other elements expressly mentioned: public, continuous and lasting cohabitation and established with the objective of family constitution". In complementarity, we can reinforce that:

> The requirements (...) are that the union be public (in the sense of notoriety, and cannot be hidden, clandestine), continuous (without interruptions, without the famous "taking a break" that is so common in dating) and lasting, in addition to the objective of the partners or cohabitants to establish a true family (*animus familae*). (SIMÃO and TARTUCE, 2010, p.277).

In view of such a statement, it must also be said that there is no need for the couple to reside in the same dwelling for the bond to be configured, precedent 382 of the STF. Stable union is recognized as a family entity, just like marriage. With this, it guarantees the same rights and duties provided for in marriage. The property regime of the stable union has partial community as a

standard. But, if they are interested, the couple can define another regime for the union, such as universal communion or universal separation of property, it is possible to formalize a private contract or public deed in a notary office between the parties. The process to obtain the declaration of stable union must be done by the couple at the Notary Office. The private contract, on the other hand, is made by the couple in the presence of a lawyer, and must establish all the rules regarding the division of assets or the dissolution of the stable union.

The stable union is a de facto situation, that is, proving the fact, confirms the stable union. Thus, if it is proven that the relationship meets the requirements of the stable union, it will be recognized as such!

STABLE UNION X CIVIL MARRIAGE: THE FACTUAL REALITY OF THE BRAZILIAN LEGAL SCENARIO

The main difference between marriage and stable union is in their formation. In marriage, the bond of two people is recognized and regulated by the State, for Venosa (2011) "Marriage is the center of family law. From it radiate its fundamental norms", while in the stable union it is necessary for the couple to start living together, as Venosa (2011) also says that they are social facts and legal facts, the stable union, is a fact of man that, generating legal effects, becomes a legal fact.

Marriage is a legal bond established between two people, to form a family. This bond is carried out through a competent authority and based on conditions described by civil law, in which it is governed by Family Law, (Book IV, articles 1,511 to 1,783) and recognized as a family entity, the marital status of the person who adopts the marriage, changes his previous state, that is, he is no longer single to married. A stable union, on the other hand, is the relationship maintained between two people who live under the same roof. And which must have a lasting, public character and with the objective of forming a family, is governed by Law 9.278/1996, "Art. 1 The lasting, public and continuous coexistence of a man and a woman, established with the objective of establishing a family, is recognized as a family entity" and according to the 1988 constitution, article 226, it is recognized as a family entity, However, the marital status of those who live in this institution is not changed.

Both marriage and common-law marriage are considered family entities. These are relationships governed by family law, guaranteed by the 1988 Constitution. Regarding the legal regime that is in force in marriage and stable union, the following definition follows, in which in marriage, the couple may opt for a specific regime for the division of assets, which must be defined in the prenuptial agreement. You can opt for mandatory separation of property, partial community of property, universal community of property, final participation in the affairs and separation of property. And if there is no definition as to the regime chosen in marriage, what will be in force is the

partial community of property. And in the case of stable union, there are no options, so it is the partial community of property that is in force. Thus, we can state that:

> The property regime between spouses comprises one of the legal consequences of marriage. In these relationships, the forms of contribution of the husband and wife to the home, the ownership and administration of common and private assets and to what extent these assets are responsible for obligations to third parties must be established. (VENOSA, 2011, p., 323)

For Gonçalves (2017) "Property regime, especially regulates the dominion and administration of both or each over the previous assets and those acquired during the marital union". Thus, the property regime to be adopted by the marriage bond is the one that meets the best needs of the spouses and the bond of the stable union can only be that of partial community of property, let's see what article 1,725 of the civil code says, "in the stable union, except for a written contract between the partners, it applies to property relations, where applicable, the regime of partial community of property", that is, what is acquired during the union is what will correspond to both, and if there is no formalization of the union, the partner is also not considered an heir.

There are legal impediments for those who want to start a family, which for marriage the legal provision is in article 1521 of the Civil Code, which restricts the union between people with a degree of kinship by blood ties or by affinity. And all legal impediments to marriage are also applicable to stable union. Thus, the rights and duties that govern the family, stable union and marriage are equal. Couples in a stable union can, at any time, convert this union to marriage, upon request made to the magistrate and then the change is made in the Civil Settlement.

WHAT IS A DEATH PENSION?

The death pension is a social security benefit granted to people who are dependents of someone who has died or in the existence of presumed death, that is, of people insured in some modalities, examples such as the insured employee, individual or optional contributor, among others, which can be either in the Own Social Security Regime - RPPS, which is intended for effective public servants, and in the General Social Security Regime - RGPS, which is intended for other workers, states CUESTa (2024) "The **death pension** is the benefit paid to the **dependents** of the insured when he dies".

In view of this, there are the appropriate means of obtaining this benefit, in both regimes, and that before the social security reform the requirements were simple to obtain the death pension, the surviving spouse or partner, regardless of the age they were at the time of death, the benefit was granted for life and the salary was 100% (one hundred percent) of what was received.

EVOLUTION AND ITS LEGISLATIVE CHANGE IN RELATION TO STABLE UNION

According to Law 8.213/1991, which regulates the main points about social security benefits, and which from article 74 onwards, begins to address some points of the death pension benefit, and the main one was to always be for life and the salary of the benefit would be the full amount, thus, there are several cases in Brazil of spouses who started receiving the death pension at a very young age and the benefit remains at a entire life. But these points have undergone changes due to changes arising from Law No. 13,135/2015.

Well, just like those who are married, and those who live in a stable union, are also part of the first class of social security dependents and, in this sense, consequently, are entitled to both urban and rural death pensions. However, in order to be entitled to this benefit in the stable union class, two requirements need to be met, they are: the deceased partner must be insured by the INSS at the time of death having at least 18 (eighteen) monthly contributions and the stable union must be characterized at the time of death for at least 2 (two) years.

In view of this, with the new law change in 2015, what was lifelong became the rule that according to the age of the surviving spouse, the duration of the death pension would be, for example, if the spouse or partner is up to 21 (twenty-one) years old, the death pension will last for three years, with 27 (twenty-seven) to 29 (twenty-nine) years, It will last 10 (ten) years, and if you are 44 (forty-four) years old or older, then it will be for life.

In this sense, even with the changes in Law No. 13,135/2015 for the quality of insured and the duration of the death pension benefit, in 2019 the social security reform, Constitutional Amendment 103/2019, took place, and with this reform, as of 11/12/2019, this type of benefit started to follow a different rule, in the form of receiving salaries, because widows before the age of 45 (forty-five) would receive only 50% (fifty percent) plus 10% per dependent up to the limit of 100% (one hundred percent), and that with the death or loss of the quality of beneficiary the quota would not be invested for the others, according to article 23, paragraph 1, EC 103/2019, before they were invested for the co-beneficiaries, According to Law No. 8,112/1990, art.223. However, for the special insured this rule does not count, as the value of the benefit will always be the minimum of one minimum wage in force, so it does not matter the date of death or the administrative request.

RURAL DEATH PENSION AND ITS MEANS OF PROVING THE STATUS OF DEPENDENT

The Stable Union is a relationship in which a couple has, in this sense the Federal Constitution equates the Stable Union to Marriage, including for social security purposes, thus being part of the **first class of** social security dependents and, consequently, is entitled to the benefit of pension for death. There are three requirements for granting the Death Pension, as stated by Oliveira

(2023), which are death or presumed death of the insured; the status of insured of the deceased, at the time of death; and the existence of dependents who can be qualified as beneficiaries with the INSS.

For couples who registered the Stable Union in a notary's office, there is no bureaucracy for proof before the INSS. For couples who have not made their bond official, it is also possible to guarantee the benefits of the National Institute of Social Security - INSS, but the path will be a little longer.

Normally, the proof of the Stable Union for the INSS happens through only two documents, the Marriage Certificate or the Stable Union, both registered in a notary's office. In the absence of these documents, it is possible to prove the relationship in other ways. According to article 16, § 6, and article 22, §3, it is necessary to present at least two documents to prove the bond of the Stable Union, says Brocanelo (2022).

To be entitled to the death pension, the partner of the insured who dies must present to the INSS at least two proofs of stable union. One of these proofs must be from a maximum of two years before death. Proof of these requirements can be made in several ways, which are: joint bank accounts, health plans in which one partner is listed as a dependent of the other, income tax return and even photos and witnesses that prove the public and notorious bond of the partners.

> Some examples of documents that may be accepted are: birth certificate of a child in common; religious marriage certificate; proof of the same domicile; joint bank account; Income Tax return in which one is listed as a dependent of the other; insurance policy in which one is the settlor and the other is the beneficiary; treatment record in a medical institution in which the partner is listed as responsible for the insured, or vice versa; among other documents that may serve for this proof. (BELTRÃO, 2023)

It is possible that the dependent will not be able to gather 3 (three) of these required documents and will be denied the benefit, as the INSS must strictly follow what is written in the law. In this case, the person can file a lawsuit in court so that other factors are also analyzed to prove this union and thus be entitled to the death pension. The stable union, whether formalized or not, allows the receipt of a death pension, not only from the INSS, but from other bodies in which the instituting person (deceased) worked. The competent documents must be presented, depending on the social security regime in which the possible pension settlor would fit.

In view of this situation, the rural death pension benefit follows some requirements for proving the quality of special insured (farmer/farmer) being indispensable, and evidence that corroborates to prove both the special quality and the dependence through the stable union, some evidential documents in which it is possible to attest such quality before the National Institute of Social Security – INSS, Follows:

- Original identification document, CPF and proof of address;
- Death certificate or document proving the death of the insured;

- Documents that prove the social security relationships and beneficiary ties of the deceased (work card, union contribution guides, union statement, store form, CAF – National Registry of Family Agriculture, PRONAF – National Program for the Strengthening of Family Agriculture);
- Documents that prove their status as a dependent (marriage certificate, children's birth certificate, judicial guardianship certificate, income tax return of the insured, in which the interested party is listed as their dependent, CADUNICO, joint bank account, insurance policy, additional credit card, among others);

In this way, with proof of the quality of insured proven and the stable union, the granting of the rural death pension benefit may be granted, if the INSS - National Institute of Social Security deems it sufficient evidence.

STABLE UNION AND ITS INFLUENCE ON THE SOCIAL SECURITY BENEFIT OF PENSION FOR RURAL DEATH

In **marriage,** as it is recognized and legalized by the State, the marriage certificate itself characterizes the veracity of the union. But there are three principles that govern this union, which are freedom of union, monogamy, and communion of life. Since in **the stable union,** as there is no recognition by the State, some elements have become essential characteristics in the recognition of this relationship, which are public coexistence, continuous coexistence and stability.

When it comes to the right that each one has inherent to the death pension, in marriage, the ease is better to request such a benefit, since it is guaranteed by the marriage certificate, that is, legalized and formalized before competent authorities, which is added to the death certificate and other documents. In the case of stable union, even if the partner is entitled after the death of his or her partner, the bureaucracy is greater, as it is necessary to prove the stable union to the INSS through an administrative procedure, and even so with all this evidence you may have the benefit denied, and which can only be resolved in the courts.

The law that regulates the death pension benefit is Law No. 8,213/91, in article 74 et seq., which is the INSS benefits law. The Death Pension is a social security benefit granted to the dependents of the insured of the National Institute of Social Security (INSS) who dies, whether he is retired or not. It is a continuous benefit, replacing the remuneration that the deceased insured received during his lifetime for the benefit of his dependents. Thus, Cuesta states:

> The death pension is the benefit paid to the dependents of the insured when he dies. The dependents of the insured are the spouse or partner, the child up to 21 years of age or disabled of any age, equivalent to children, parents and siblings up to 21 years of age or disabled of any age. (CUESTA, 2024)

The death pension does not require **a grace period** by the insured, but depending on the duration of the relationship and the age of the surviving spouse or partner, it may not be lifelong, because with the advent of Law 13,135/15, article 77, § 2, V, paragraph c, there was a change in relation to the duration of the death pension in order for this benefit not to be always lifelong for the spouse. Thus, Ramos (2022) states that:

> In addition to proof of 18 (eighteen) monthly contributions and at least **two years of union**, the duration of the pension will depend on the age of the dependent. Also, if the two years are not completed, he will be entitled to receive the benefit for four months. For the children, the death pension will be due until the age of 21 (twenty-one), and for the disabled adult child, as long as this condition lasts.

There is the possibility that the benefit of the death pension can be paid to those who lived in a stable union with the deceased partner, as long as they prove the requirements that qualify it, which are continuous, publicly and lasting coexistence, as stated by Simão and Tartuce (2010) in which the "requirements (...) are that the union is public (in the sense of notoriety, it cannot be hidden, clandestine), continuous (without interruptions, without the famous "taking a break" that is so common in dating) and lasting" with the intention of forming a family.

RATIFICATION WITH THE GRANTING OF THE RURAL DEATH PENSION BENEFIT

Ribeiro (2012) says that marriage is the family that tradition, interpreted by positive law, bequeathed to us, thus ensuring legal certainty, and was seen as an absolute truth, where the bride and groom established full communion of life, with rights and duties, with protection and reciprocal fidelity, and that they mutually cared for their children. However, what has been demonstrated throughout this article is that currently, there are other forms of families, that is, the concept of this is no longer the same, and can arise in different ways, summarizing affection.

In this way, the Federal Constitution of 1988, recognized, within the positive law, the stable union as a family form, attributing to it the partial property regime and all the guarantees, in case of divorce or death of the partners. After that, in 2002, in the Civil Code it was also recognized as a family entity, but it would have to comply with requirements that led to believe that it was a stable union between man and woman, which are a public, continuous and lasting coexistence, also submitting to loyalty and fidelity between them, as Ribeiro (2012) also states:

> Stable union comprises the family arrangement that has the appearance of marriage, but its plot did not begin with the formalities of marriage. It is a relationship configured in public, continuous and lasting coexistence and established with the objective of family constitution (CC/2002, art.1733). Companions submit to the duties of loyalty, mutual respect and assistance.

In this sense, fulfilling requirements that prove the stable union, for the granting of the rural death pension benefit is no different, the special insured needs to gather evidence that will help him to achieve the benefit of right, and some evidence of paramount importance that in addition to proving his quality of insured, will also prove the companionship, proving the last two years, they are registration with CAF – National Registry of Family Farming, PRONAF – National Program for the Strengthening of Family Farming, in addition to joint bank accounts, among others.

In addition to the above, considering that it is not only an economic issue, but one of social justice, as many were financially dependent on the loved one who died, it is the guarantee of a monthly income through the rural death pension benefit, which can supply and provide a dignified life for the surviving family members.

METHODOLOGY

For the development of this article, whose theme addresses **THE PROOF OF STABLE UNION FOR THE PURPOSES OF SOCIAL SECURITY BENEFIT OF PENSION FOR RURAL DEATH,** the taxonomy of Vergara (2011) was used, which qualifies the classification of the research in two aspects:

As for the purposes - the article was developed through an exploratory research. According to Vergara (2011), exploratory research is carried out in an area in which there is little accumulated and systematized knowledge.

As for the means – it is a bibliographic research. In relation to this type of research, Marconi and Lakatos (2003) state that its purpose is to put the researcher in direct contact with everything that has been written, said or filmed on a given subject, including conferences followed by debates that have been transcribed in some way, whether published or recorded. In this way, bibliographic research is not a mere repetition of what has already been said or written about a certain subject, but provides the examination of a theme under a new focus or approach, reaching innovative conclusions. In this way, search platforms such as Google Scholar and SCIELO were used, delimiting the search for articles in the period from 2020 to 2024, and that the keywords used were Pension for death, pension for rural death, stable union, pensioner, social security benefits, this delimitation brought crucial information for the preparation of this article.

CONCLUSION

As a conclusion, this article, which deals with the proof of stable union to acquire a social security benefit of pension for rural death, addresses a legal and social analysis in relation to this family modality in which many Brazilians live, the Stable Union, as a civil status, and regulated in legal provisions, bring numerous contributions and guarantees to the partner, such as some

addressed in this article, providing rights to the social security benefit of pension for rural death, through documents and requirements explained, that is, to the dependents of an insured who dies. Because this benefit is a financial guarantee for that family that has lost a loved one and, in addition to suffering the pain of the loss, it can suffer an impact on the budget, because most families end up being the deceased.

CUESTA (2024) says that the death pension is the benefit paid to the dependents of the insured when he dies, and that whose dependents of the insured are the spouse or partner, children up to 21 (twenty-one) years of age, or when the child has a disability, which can be any age.

It was noted that there are specific requirements for a person living in a stable union to be considered dependent on the insured and to obtain the benefit through documents that corroborate the certainty that they lived in a public, continuous and lasting union and that they had the objective of establishing a family. It is also necessary to observe the calculations regarding the amount of the death pension benefit to prevent it from being granted with an amount below what is due.

In view of what has been presented, it is possible to affirm that through the documents listed, the person who lives socially in a stable union is able to obtain the social security benefit of pension for rural death, following the requirements and meeting the criteria that are presented, guaranteeing him/her as a partner or dependents, if any, financial help for being the deceased insured special.

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Conceptual debates on initial reading instruction and literacy

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Paula Rejane de Araújo Valente[1] and Pérsida da Silva Ribeiro Miki[2]

ABSTRACT

This text explores the concepts of literacy, literacy and literacy through a qualitative approach. The methodology used included bibliographic and documentary analysis to achieve the proposed objectives. The study sought to understand the conceptual differences between literacy, literacy and literacy, based on bibliographic reviews of works by Soares (2009, 2017a, 2017b, 2020), Kleiman (1995, 2005) and Tfouni (2002, 2018). In addition, the study proposed a debate on the approximation and opposition of these concepts in the official documents that guide educational policies for the teaching of reading and writing in Brazil, such as the National Curriculum Parameter of Portuguese Language (PCNs LP), the National Common Curricular Base (BNCC), Decree No. 9,765 of 04/11/2019, which instituted the National Literacy Policy, and the Guiding Notebook of the National Literacy Policy (PNA). As a result, the terms literacy, literacy and literacy play important roles in educational practices, being found both in normative teaching documents and in continuing education activities for teachers (Pró-Letramento and PNAIC). It is worth mentioning that they are not teaching methods nor synonymous, as each one has its own specificity, although they are closely related. Thus, it is crucial that education professionals who plan pedagogical actions in the process of teaching reading and writing can clearly identify these terms.

Keywords: Reading and writing, Theoretical conception, Educational public policy, Brazilian reality.

[1] Highest Graduation: Master of Education
Academic Institution: Federal University of Amazonas - UFAM
[2] Highest Graduation: Doctor of Education
Academic Institution: Federal University of Amazonas - UFAM

INTRODUCTION

This research is an integral part of an investigative trajectory funded by the Coordination for the Improvement of Higher Education Personnel (CAPES), with support from the Foundation for Research Support of the State of Amazonas (FAPEAM), focusing on the category of literacy study. Based on the reflection that different terms arise in school activities, and that they come from educational reforms, it is essential that these terms are understood by professionals, avoiding misunderstandings.

In this context, the objective of this work is to answer the following questions: how do Brazilian researchers who study the linguistic and sociocultural aspects of reading and writing use the concepts of literacy, literacy and literacy? Is it possible to understand these concepts from their linguistic definitions? And how do the documents that guide educational policies in Brazil contribute to making the concepts clear to basic education professionals?

Acknowledging the vast literature on the subject, this research has two main objectives: to understand the conceptual differences between literacy, literacy and literacy, through a bibliographic review of the research of Magda Soares, Angela Kleiman and Leda Tfouni that contribute to the training of literacy teachers in the country; and to promote a debate on the convergence and divergence of concepts in the current documents that guide the teaching of reading and writing in Brazil, such as the National Curriculum Parameter of Portuguese Language (PCNs LP), the National Common Curricular Base (BNCC), Decree No. 9. 765 of 04/11/2019, which establishes the National Literacy Policy and the Guiding Booklet of the National Literacy Policy (PNA).

The research has a qualitative approach, because "[...] it is considered a dynamic and systematic procedure of targeted investigation, based on what is being investigated (Guilherme; Cheron, 2021, p. 100). The methodology is based on a bibliographic study that allows direct contact with the theme (Oliveira, 2007), and on the analysis of primary documents that did not receive analytical treatment from other authors (Helder, 2006).

In the bibliographic research, the theoretical studies of Magda Soares (2009, 2017a, 2017b, 2020); Angela Kleiman (1995, 2005) and Leda Tfouni (2002), as the authors discuss the conceptions of the terms literacy, literacy and literacy, based on anthropological, sociological, linguistic, cognitive, historical and cultural approaches, providing an understanding of the distinct concepts that reflect sociocultural relations, beyond school spaces, contributing to the training of teachers in the country.

Regarding the primary documents, an analysis was carried out of those that support the public educational policy in the country, including the National Curriculum Parameters (Portuguese Language), National Common Curriculum Base (BNCC), Decree No. 9. 765, of 04/11/2019, which establishes the National Literacy Policy, and the Guiding Notebook of the National Literacy Policy

(PNA). Through this study, we understand that the concepts of literacy, literacy and literacy are not identical, but are interdependent in formal teaching practices and in interactive and cultural learning actions in life in society.

LITERACY, LITERACY AND LITERACY: DISTINCT AND INTERDEPENDENT CONCEPTS

Functional illiteracy represents one of the great challenges faced by the Brazilian population, preventing the ability to fully master reading and writing as a sociocultural and historical right. A fundamental right and a basic necessity for learning, universal literacy for children and adults is the indispensable condition for the full exercise of freedom (UNESCO, 2003).

The democratization of education, from the twentieth century onwards, is marked by the expansion of the culture of writing in the social, cultural, economic and political development of Brazil. And the visibility of reading and writing practices, in the social and professional fields, triggered the need to advance, even more, on the skills of reading and writing in a social context (Soares, 2009).

Schools have also undergone changes, as they began to face the consequences of school failure rates in literacy, thus there is a need to rethink teaching practices. Soon, literacy became a legitimate and necessary theme of studies and scientific investigation in Brazil, from the 1960s onwards (Soares; Maciel, 2000).

Elementary education came to be seen as a means of enabling the formation of a society, in which schooling promoted significant learning. And in order to achieve this learning, the teaching processes should contemplate social practices, considering the meaning of experiences outside the walls of schools.

Magda Soares (2017a, 2017b, 2020) addresses that the term literacy, as a writing practice, is the visual representation of the sound chain of speech, and emphasizes that it is the ability of "writing technology", together with learning the representation of the alphabetic, orthographic and psychomotor system. To this end, it is opportune to understand that literacy has several facets because it is complex and part of the linguistic sciences. Thus, Soares (2017a, p. 27) emphasizes that: "Literacy, in the current state of linguistic sciences, Cognitive Psychology, Developmental Psychology, is a complex process that involves several components, or facets, and demands different competencies."

By pointing out the main facets of written language learning, Soares (2017b) bases three, namely: linguistic, interactive and sociocultural. These insert the individual into the world of reading and are part of the methods and proposals for the conception of written language. The author discloses each facet in a theoretical and didactic way, enabling the understanding of the

interrelationship they maintain and the potentiality of the teaching work when considering them in didactics.

The linguistic facet of the written language is the most fundamental stage of the literacy process (Soares, 2017b). The author reinforces that, "at first, letters are, for the child, visual forms. He sees letters and learns to name letters in a process that is not fundamentally different from the acquisition of vocabulary in oral language" (Ibidem, p. 209-210, emphasis added).

In line with this conception, the learner of the written language must have the opportunity to learn the other facets of language interaction (interactive and sociocultural), which are present in daily life. The interactive facet of the written language is established "as a vehicle for interaction between people, for expression and understanding of messages [...] the object is the skills of comprehension and production of texts" (Soares, 2017b, p. 29). While the sociocultural facet, the learner is located around the "uses, functions and values attributed to writing in sociocultural contexts" (Ibidem).

Soares (2017b) points out that the three facets are distinct objects of knowledge when composing the process of initial learning of the written language and that they are related to different cognitive and linguistic domains. The interactive and sociolinguistic facets are linked to literacy practices, which implies the insertion of the individual in the "reading and production of real texts, of social practices of reading and writing" (Soares, 2020, p. 27).

Consequently, they are skills that need to be developed together in the literacy process. Thus, it is important to understand that learning is not established in isolation from the socio-cultural actions experienced by the learners, as Kleiman (2005, p. 5) reinforces: "When a child, a young person or an adult is taught to read and write, this learner is getting to know society's literacy practices".

The terms literacy and literacy are often discussed in scientific research and serve as a reference to the implementation and implementation of public policies, aimed at teacher training and the service of basic education students in Brazil. Some of the national reference documents are the National Curriculum Parameters (1997), Pro-Literacy (2008), National Pact for Literacy at the Right Age (2012), the National Textbook Program (PNLD) and the National Common Curriculum Base (2018).

In 2019, Decree No. 9,765 of 04/11/2019 was instituted in the country, which established the National Literacy Policy. Article 1 aims to "[...] to improve the quality of literacy in the national territory and to combat absolute illiteracy and functional illiteracy, within the scope of the different stages and modalities of basic education and non-formal education". This document established the pedagogical actions in favor of the conception of reading and writing, in terms of literacy and literacy, based on scientific evidence from the cognitive science of reading "which is especially

concerned with the linguistic, cognitive and cerebral processes involved in learning and teaching reading and writing skills [...]" (Brazil, 2019, p. 20).

Decree No. 9,765, of 04/11/2019, brings the concepts of literacy and literacy as appropriate references for the reformulation of the documents that guide the formative processes and teaching of reading and writing for students in different regions of the country. In addition, these terms are presented in the Guiding Notebook of the National Literacy Policy (PNA). It is worth noting that the term "literacy" is not mentioned in these official documents.

DISCUSSING THE RESULTS

The concepts of literacy, literacy and literacy, present in the current National Literacy Policy (which abolished the term literacy) will be discussed with the mediation of some theorists and their foundations: Magda Soares (2009, 2017a, 2017b, 2020), Leda Tfouni (2002), Angela Kleiman (1995), as well as the passages of the teaching guiding documents that systematize the educational policy, in order to understand the distinctions, encounters and disagreements of terms, in a theoretical perspective on the conception of reading and written production.

The authors were selected due to their contributions to the processes of pedagogical training in the country, influencing the teaching practice and providing a theoretical basis for the political-pedagogical actions implemented over more than twenty years in the Brazilian context. His works were important for pedagogy courses, municipal and state curricula, academic productions, continuing education of teachers (such as Pró-letramento, PNAIC), and for scientific production and formulation of public policies related to literacy in Brazil.

The Portuguese Language Curriculum Parameter (1997) and the BNCC (2018) highlight, even with twenty-one years of distance between these documents, that literacy refers to the knowledge of the writing and reading techniques of the alphabetic system, while literacy encompasses the participation of individuals in a critical way in real social practices of reading and writing. The BNCC also introduces the concept of "multiliteracy", which involves the participation of students in different languages, including digital.

Literacy is defined by Leda Tfouni (2002) as the practice of writing and reading skills; therefore, writing and language practices, relating it to the individual scope. Literacy, on the other hand, focuses on the sociocultural aspects of the acquisition of writing in societies that adopt a writing system, in a restricted or generalized way. In short, the author also emphasizes that literacy is a broader process than literacy and, that it contains and determines it, "it is related to the existence and influence of a writing system, socially prevailing in a literate society" (Tfouni; Pear tree; Assolini, 2018, p. 17).

Similarly, Angela Kleiman (1995) conceptualizes literacy as a set of knowledge about the written code of the language, encompassing the acquisition of the first letters and orthography; the involvement of cognitive operational sequences and the child's physical-motor engagement. He defines literacy "as a set of social practices that use writing, as a symbolic system and as a technology, in specific contexts, for specific purposes" (p. 18-19), and concludes that literacy and literacy are inseparable.

In line with this statement, we confirm with the studies of Magda Soares (2017b), when considering literacy as the process that comprises the two facets of written language: interactive and sociocultural, as a vehicle for interaction between individuals in the most different forms, expressive and comprehensive values of messages. Considering that literacy and literacy are distinct processes, however, inseparable, Soares (2017a) asserts that:

> Dissociating literacy and literacy is a mistake because, within the framework of the current psychological, linguistic and psycholinguistic conceptions of reading and writing, the entry of the child (and also of the illiterate adult) into the world of writing occurs simultaneously through these two processes: by the acquisition of the conventional writing system – literacy – and by the development of skills to use this system in reading and writing activities, in the social practices that involve written language – literacy (p. 44-45, emphasis added).

The author also advises that literacy practices outside of school translate relevance to social objectives for those who participate in the situation. In this sense, transposing these experiences to school spaces collaborates with the development of students' skills and competencies in learning the written language. It can also be inferred from Kleiman (2005, p. 6) that the "concept of literacy emerges as a way to explain the impact of writing in all spheres of activities and not only in school activities".

Analyzing the definitions of Soares (2017a, 2017b, 2020), Kleiman (2005) and Tfouni (2002), we observe that the processes are different, but there is an interdependence between the terms: literacy and literacy. While literacy refers to reading skills and the practice of writing associated with formal education, literacy is the engagement of individuals in real social practices of reading and writing production. In this sense, considering real practices of reading and writing production in school spaces collaborates significantly with the process of acquisition of reading and writing by learners.

The definitions of the terms literacy and literacy were also present in teacher training policies in the country. Pro-literacy and PNAIC stand out. In the formative guidance material for literacy teachers, the Pro-literacy Program (2008), emphasized that:

> With the emergence of the terms literacy and functional literacy, many researchers began to prefer to distinguish literacy and literacy. They began to use the term literacy in its restricted sense, to designate the initial learning of reading and writing, of the nature and functioning of the writing system. They correspondingly began to reserve the terms literacy or, in some

> cases, functional literacy to designate the uses (and the skills of use) of the written language (Brasil, 2008, p. 10).

As for the PNAIC (2015), the national policy for the training of literacy professionals, it had the position of stating that,

> The conception adopted within the scope of the PNAIC is that of Literacy from the perspective of Literacy. In other words, it is understood and defended that it is necessary for the child to master the Alphabetic Writing System, but also to develop skills to make use of this system in various communicative situations, with autonomy (Brasil, 2015, p. 21).

Thus, it is inferred that the policies aimed at the concepts of literacy and literacy in the country, in a coherent way, prior to the PNA (Brasil, 2019b), expressed the concepts of the terms literacy and literacy as processes that should be part of teacher training and, consequently, of teachers' didactic actions in school spaces. This was without dissociating the conceptual assumptions that supported them for the formulation of school projects and activities that aimed to teach students to read and write.

Another term discussed is literacy, recurrent in the text of Decree No. 9,765, of 04/11/2019, and in the PNA Guiding Notebook (Brasil, 2019b), the conceptual similarity with the term literacy, widely disseminated in the country, is remarkable. Above all, the official document did not refer to the term literacy, but to literacy, considering:

> I. literacy – teaching of reading and writing skills in an alphabetic system, so that the literate person becomes able to read and write words and texts with autonomy and comprehension; VII. literacy – set of practices and experiences related to reading and writing and its productive practice. (Brazil, 2019a, p. 50-51).

Through the foundations presented by the theorists throughout this text, the two items of the PNA present conceptual approximations between the terms literacy and literacy. Subjectively, it is analyzed that the Brazilian government policy chose to abolish the term literacy from widely disseminated educational projects, without considering all the knowledge historically produced by scientific research in the country and the diversity of political agendas of a formative nature of basic education professionals.

The documents cited aimed to promote literacy in Brazilian society, through "scientific evidence", based on the cognitive science of reading, as highlighted in the PNA Guiding Notebook (Brasil, 2019b), signed by Carlos Francisco de Paula Nadalin[3], Secretary of Literacy1. The document highlighted the use of the term literacy in a scientifically terminological way, in order to align with other Portuguese-speaking countries that use the term literacy (in English) and littératie (in French), and presents as a justification for making the decision on the term: "the option to use it brings several

[3] Secretary of Literacy in Brazil – Government of President Jair Messias Bolsonaro (2019-2023).

advantages, as it is a way of aligning with internationally consolidated scientific terminology" (Brasil, 2019b, p. 21).

The researchers referenced in this research define the term literacy in a similar way to the term literacy in their works, even before the launch of the National Literacy Policy. This demonstrates the concern of science in favor of literacy in the country. Magda Soares (2009) points out that the term literacy is a translation into Portuguese of the English term literacy, being defined as "the condition of being literate". Tfouni (2002) highlights the overlap between literacy and literacy, emphasizing the focus on practices, skills, and knowledge related to the encoding and decoding of written texts. Kleiman (1995) highlights "empowerment through literacy" as a watchword in literacy studies, indicating the potential it provides.

Thus, the definitions presented by the theorists throughout this text involve the process of systematic teaching of reading and writing and the conscious use of these skills in various individual and community interactions in the Brazilian context.

FINAL CONSIDERATIONS

The study provides us with an uncomplicated understanding of the terms literacy, literacy and literacy, thanks to the contributions of authors Soares, Tfouni and Kleiman. In general terms, these researchers explain that literacy refers to the consolidated acquisition of the visual representation of the sound chain of speech, that is, it is the ability to competently use the alphabetic system. On the other hand, literacy and literacy involve the interactive and sociocultural use of written language in various contexts, such as social, professional, scientific and political.

The authors also point out that the terms literacy and literacy have similar semantics. To reach this conclusion, they sought to understand the relationship between the term "literacy" present in the foreign vocabulary and the term literacy. Until 2018, the term literacy was widely used in the cultural practices of school contexts in Brazil. This is evidenced by the guiding documents for education, such as the National Curriculum Parameters (PCNs) and the National Common Curriculum Base (BNCC).

The concepts of literacy and literacy underpinned the political bases for teacher training in the country (Pró-Letramento and PNAIC), which preceded the PNA (2019). Therefore, the concepts addressed by Brazilian researchers helped in the organization of these training policies, with a view to eliminating illiteracy in Brazil.

With the national dissemination of the term literacy in the Brazilian educational system with the implementation of Decree No. 9,765 of 04/11/2019 and the guidelines of the PNA Guiding Notebook (Brasil, 2019b), other formulations raised on the conceptual bases in relation to the teaching of literacy were questioned. The objective of this policy was to "homogenize" the term in

the country, to align it with those used in other first world countries, such as the United States, England, France and Portugal. And this has paid attention to the erasure of the term literacy from the various political-pedagogical actions already established in Brazil.

Literacy does not end in concepts about its terms, it presents itself as a field of study of education, and must be understood in the most diversified approaches that contemplate teaching and learning for the acquisition of reading and written production. The concepts of literacy, literacy and literacy must be recognized and demystified, so that there are no doubts and/or confusion in the understanding of literacy policy and in the teaching work to promote teaching.

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Inventory of medicinal species employed by IEPA, Macapá-AP

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Maria Aparecida Corrêa dos Santos[1] and Márlia Coelho-Ferreira[2]

ABSTRACT

The IEPA (Institute of Scientific and Technological Research of the State of Amapá), through the Center for Medicinal Plants and Natural Products, has been dedicated to the production of herbal medicines and phytocosmetics from regional raw material, selecting species based on ethnopharmacological information and the absence of reports of toxicity. In this context, Amapá takes an innovative path, with research and development of products from Amazonian biodiversity as priorities, aimed at meeting social and economic demands, but seeking to follow the guidelines recommended by the World Health Organization/WHO, regarding encouraging the use of medicinal plants in Primary Health Care/PHC. However, in order for this pioneering work to give economic return to the region and gain visibility outside the limits of this State, it must meet the requirements of the National Health Surveillance Agency/ANVISA, established in RDC 17, which provide for the registration of herbal medicines. Hence the importance of this work which, using conventional methodology, collected botanical information on thirteen species of the Amapá phytopharmacopoeia, used by the IEPA.

Keywords: Ethnobotany, Medicinal plants, Amapá, IEPA

[1] Master in Botany, Researcher, Center for Medicinal Plants and Natural Products, Institute of Scientific and Technological Research of the State of Amapá.
E-mail: santosmac@yahoo.com
[2] Doctor in Biological Sciences, Researcher, Botany Coordination, Emílio Goeldi Museum of Pará.
E-mail: mcoelho@museu-goeldi.br

INTRODUCTION[3]

The association between biological diversity and cultural diversity has been the basis for the development of several disciplines that have as a background the knowledge of traditional populations about the biological and physical environment. One of the products of this association is present in health care, represented by traditional medicine, whose main aspect refers to the use of natural remedies. However, in general, the raw material to produce these medicines comes from extractivism, which is very old in the Amazon and has increased with the growing demand for products of natural origin. This fact leads to the need to modernize extractive activity, which must aim to protect natural resources and ensure the permanence of local communities in the areas they traditionally inhabit, offering conditions for improving their quality of life (AMAPÁ, 1999).

In a simplified way, the natural environments of Amapá can be grouped into two major physiognomic categories: 1) forested forms, a category that includes mangroves, along the coastline; floodplain forests, directly linked to riverine environments; upland forests, with the largest representation in the state; and transition forests, in areas of ecological tension; 2) non-forested or grassland forms, which includes the cerrado and floodplain or floodplain fields in depressed areas of the alluvial plain (ZEE, 2002). In addition to all these ecosystems, the state has a very diverse ethnic composition, consisting of six indigenous ethnic groups and one Afro-American ethnic group that preserves their customs and traditions in an important way (AMAPÁ, 1999), in addition to the caboclo population that develops a particular way of life.

According to the IBGE (*apud* BRASIL-MMA/SCA, 1998), in the Legal Amazon there are approximately 650 plant species of economic value with pharmacological activity, with Amapá occupying the fourth place with 380 species. In this case, species such as andiroba (*Carapa guianensis*) and copaiba (*Copaifera* spp.), which are widely spread regionally and nationally, deserve to be highlighted.

Through the IEPA, Amapá takes an innovative path, assuming as priorities the research and development of products from Amazonian biodiversity, aimed at meeting social and economic demands, but seeking to follow the guidelines recommended by the World Health Organization/WHO (AKERELE, 1992), about encouraging the use of medicinal plants in Primary Health Care/PHC. However, for this pioneering work of providing services to the Amapá community to give economic return to the region and gain visibility outside the limits of this State, it must meet the requirements of the National Health Surveillance Agency/ANVISA, established in RDC 48 (BRASIL, 2004), which provide for the registration of herbal medicines.

[3] Article originally published in Amazônia magazine: Ci. & Desenv., Belém, v.1, n.1, jul. /ten. 2005.

This study aimed to map and inventory the extractive species used in the production of herbal medicines and/or phytocosmetics, in the areas where they have been collected, with a view to controlling the origin of the plant raw material and adding value to IEPA products.

MATERIAL AND METHODS

This work was developed in the main areas of origin of the raw material used by IEPA. These areas are in the municipalities of Macapá (in the Bailique Archipelago District), Porto Grande and Mazagão, in the state of Amapá, and Ilha do Pará, in Pará, which include floodplain forests and upland and cerrado.

The locations of the inventories were defined based on information collected from the production team, in the Division of Phytotherapy/DF of the IEPA. The geographic coordinates of these areas were obtained using GPS and the placement of the points on the map was done by the Amapá Economic Ecological Zoning team (ZEE, 1998).

The inventory was made based on observation and collection and started from the location of specimens of the target species. Using the plot method proposed by Muller-Dombois and Ellenberg (1974), the species (Table 1) were sampled in continuous plots of 20m *x* 50m or 20m *x* 30m, according to the characteristics of the area. For veronica, which has a different habit from the others (it is a liana while the other species are trees or shrubs), sub-plots of 10m *x* 20m were used. For the study of the occurrence of the species, bibliographic reviews and consultations were made to the herbaria of the IEPA itself, EMBRAPA/CPATU, MPEG and IRD-Cayenne, indexed as HAMAB, IAM, MG and CAY, respectively (HOLMGREN et al., 1990).

As for the biological form, the species were classified as trees, shrubs, subshrubs, lianas or herbs, according to Vidal and Vidal (1992). The individuals were counted and, from each sampled specimen, the circumference at breast height (PAC, in centimeters), standardized at 1.30m from the ground, the total height (in meters) and, whenever possible, their phenological status was verified. In addition, a brief description of the area was made.

With the use of the FITOPAC software (a set of programs that allow the calculation of phytosociological parameters and the analysis of vegetation survey data), developed by Dr. Shepherd, from UNICAMP, the basal area, density, frequency and absolute dominance of each species were evaluated.

The material for the herbarium was collected according to the techniques defined by Fidalgo and Bononi (1984). Exsiccates were deposited at the Herbarium Amapaense/HAMAB, located at IEPA, and duplicates are available for exchange.

RESULTS AND DISCUSSION

13 of the 14 extractive species used by the IEPA were inventoried, whose habits, habitats and inventory numbers per municipality are shown in table 1. The inventories carried out along the highways, BR 156 and BR 210, are added to those of Porto Grande, as they are located close to this municipality.

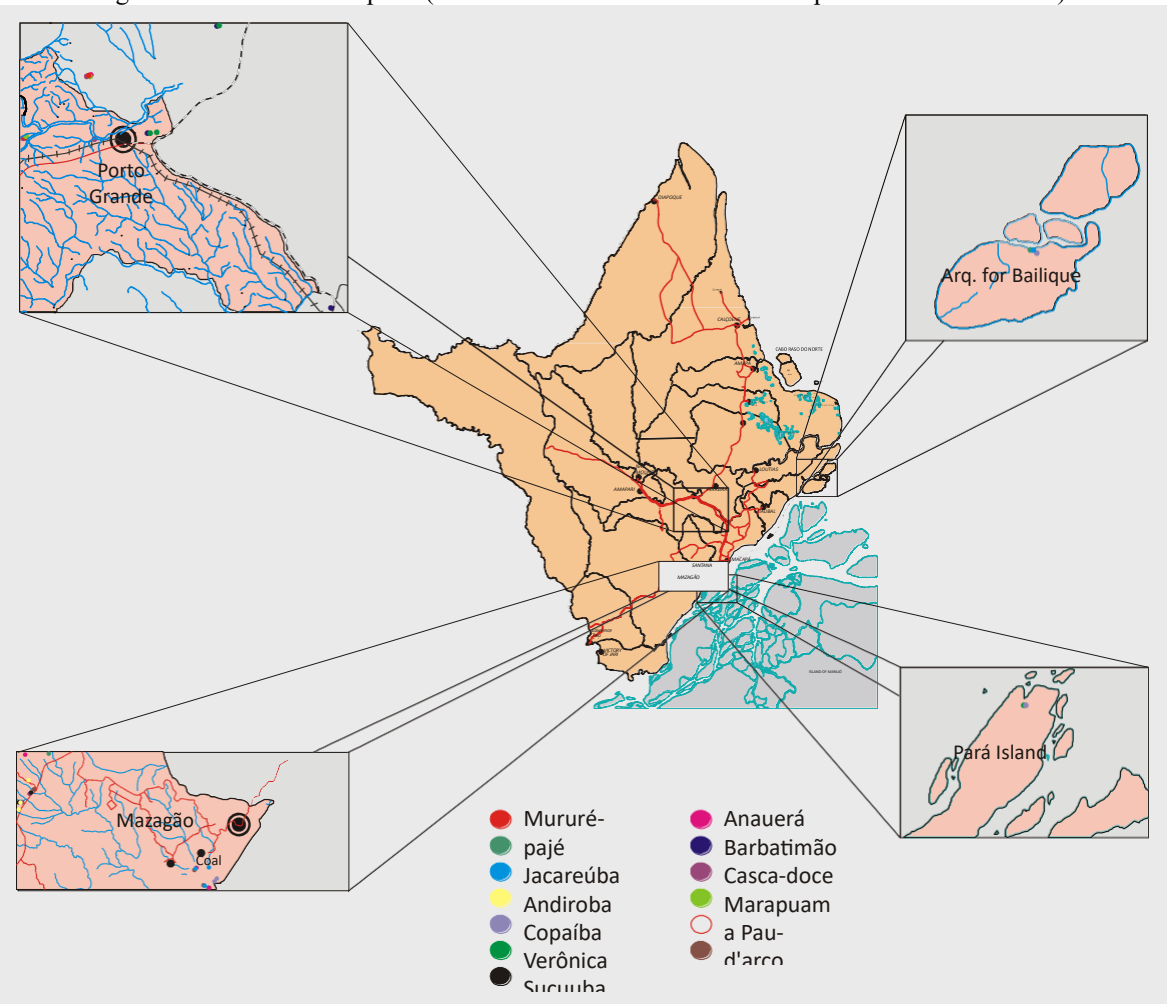
Table 1: Habit, habitat and number of inventories carried out for each species, by municipality.

POPULAR NAME	SCIENTIFIC NAME	HABIT	HABITAT	NUMBER OF INVENTORIES BY MUNICIPALITY				
				MACAPÁ	MAZAGÃO	PORTO GRANDE	PARÁ ISLAND	TOTAL
Anauerá	*Licania macrophylla* Bentham	Tree	FV		3	1		4
Andiroba	*Carapa guianensis* Aublet	Tree	FV	1	4			5
Barbatimão	*Ouratea hexasperma* (St. Hil.) Baill.	Bush	Ce			3		3
Sweet shell	*Pradosia huberi* Ducke (Ducke)	Tree	TF		2	2		4
Copaiba	*Copaifera guianensis* Desfontaines	Tree	TF		3			3
Faveiro	*Vatairea guianensis* Aublet	Tree	FV		3			3
Jacareúba	*Calophyllum brasiliense* Cambessedes	Tree	FV	1	1		1	3
POPULAR NAME	**SCIENTIFIC NAME**	**HABIT**	**HABITAT**	**NUMBER OF INVENTORIES BY MUNICIPALITY**				
				MACAPÁ	**MAZAGÃO**	**PORTO GRANDE**	**PARÁ ISLAND**	**TOTAL**
Jatoba	*Hymenaea courbaril* L.	Tree	TF		2	2		4
Marapuama	*Ptychopetalum olacoides* Bentham	Tree	TF			3		3
Mururé-pagé	*Brosimum* cf. *utile* (Kunth) Pittier	Tree	TF			2		2
Pau-d'arco	*Tabebuia* sp.	Tree	TF			1		1
Sucuuba	*Himatanthus articulatus* (Spruce ex Müller-Argovensis) Woodson	Bush	Ce			3		3
Veronica	*Dalbergia monetaria* L. f.	Liana	FV	1	2		1	4

Habitats considered: FV: Lowland Forest; TF: Terra Firme Forest; Ce: Cerrado.

From the geographic coordinates, distribution maps of the 13 species were generated in the areas studied. The maps with the location of the inventories, by species, are shown in figure 1. The vegetation of these areas includes floodplain forest, terra firme forest, and cerrado.

Figure 1: Location of the plots (indication of the areas where each species was inventoried).



MAPPING AND INVENTORY

Table 2 presents a summary of the results obtained in the inventories. The averages obtained with the FITOPAC program, for each species, in the different areas are presented.

Table 2: Synthesis of the results obtained in the inventories.

Species	Inventory number/location	Number/size of plots	FA (%)	OF (IND/ha)	DBH		AB	Height	
					Medium	Standard deviation	(m2/ha)	Average	Standard deviation
Licania macrophylla Bentham	1- Mazagão	10 (20x50)	70	11	9,35	6,05	0,104	10,36	4,31
	2- Mazagão	10 (20x50)	50	15	15,79	13,68	0,5	13,07	7,56
	3- Mazagão	1 (10x1000)	100	27	22,31	11,55	1,32	15,59	8,4
	4- Porto Grande	10 (20x50)	50	16	26,35	19,97	1,34	23,29	15,86
Carapa guianensis Aublet	1- Macapá	10 (20x50)	70	7	17,6	18,73	0,33	17,43	4,79
	2- Mazagão	10 (20x50)	80	19	24,23	13		18,26	7,12
	3- Mazagão	10 (20x50)	60	15	17,72	12,92	0,55	13,47	6,85
	4- Mazagão	10 (20x50)	80	26	32,15	14,98	2,55	22,15	4,3
	5- Mazagão	10 (20x50)	60	8	32,75	8,5	0,71	21,13	3,27

Ouratea hexasperma (St. Hil.) Baill.	1- Porto Grande	10 (20x50)	100	102	11,12	9,95	1,77	2,43	0,78
	2- Porto Grande	10 (20x50)	40	4	26,02	24,6	0,35	2,75	0,95
	3- Large Proto	10 (20x50)	10	1	1,59	0	0,0002	1,25	0
Pradosia huberi Ducke (Ducke)	1- Mazagão	10 (20x50)	20	2	20,06	20,25	0,095	26,5	26,16
	2- Mazagão	10 (20x50)	20	2	26,26	0,226	0,108	21	1,41
	3- Large Proto	10 (20x50)	10	1	63,98	0	0,32	30	0
	4- Porto Grande	10 (20x50)	10	1	56,97	0	0,25	30	0
Copaifera guianensis Desfontaines	1- Mazagão	10 (20x50)	10	1	64,93	0	0,33	40	0
	2- Mazagão	10 (20x50)	20	2	59,68	15,52	0,578	31,5	2,12
	3- Mazagão	10 (20x50)	70	10	28,41	25,8	1,1	19,84	16,6
Vatairea guianensis Aublet	1- Mazagão	10 (20x50)	40	4	42,42	14,28	0,613	26,25	4,92
	2- Mazagão	10 (20x50)	20	2	48,23	8,32	0,37	26	2,82
	3- Mazagão	1 (10x1000)	100	18	31,88	10,36	1,58	21,78	7,3
Calophyllum brasiliense Cambessedes	1- Macapá	10 (20x50)	10	1	49,33		0,19	20	
	2- Pará Island	10 (20x50)	60	6	29,82	12,33	0,479	20,83	6,73
	3- Mazagão	10 (20x50)	40	5	26,67	19,13	0,39	20,2	6,05
Hymenaea courbaril L.	1- Mazagão	10 (20x50)	10	1	36,92		0,107	25	
	2- Mazagão	10 (20x50)	50	6	64,83	21,55	2,16	32	9,89
	3- Large Proto	10 (20x50)	10	1	89,76	0	0,63	34	0
	4- Porto Grande	10 (20x50)	10	1	62,07	0	0,302	32	0
Species	**Inventory number/location**	**Number/size of plots**	**AF (%)**	**ALSO (ind/ha)**	**DBH**		**OFF**	**Height**	
					Medium	**Standard deviation**	**(m2/ha)**	**Average**	**Standard deviation**
Ptychopetalum olacoides Bentham	1- Porto Grande	1 (20x30)	100	400	1,58	3,8	0,51	1,38	1,83
	2- Porto Grande	1 (20x30)	100	450	2,27	2,62	0,41	2,48	3,94
	3- Large Proto	10 (20x50)	70	13	9,94	9,74	0,19	9,65	6,62
Brosimum cf. *utile* (Kunth) Pittier	1- Porto Grande	4 (20x50)	50	7,5	34,59	20,67	0,87	35,67	13,65
	2- Porto Grande	10 (20x50)	10	1	56,97	0	0,25	30	0
Tabebuia sp.	1- Porto Grande	10 (20x50)	30	6	80,06	12,144	3,07	38,17	2,85
Himatanthus articulatus (Spruce ex Müller-Argovensis)	1- Porto Grande	10 (20x50)	90	66	12,28	16,52	2,05	2,51	1,98
	2- Porto Grande	10 (20x50)	80	21	14,41	8,31	0,451	3,94	1,93
	3- Large Proto	10 (20x50)	20	6	6,47	6,37	0,036	2,22	0,94

Woodson									
Dalbergia monetaria L. f.	1- Mazagão	25 (10x20)	40	30	5,11	2,54	0,076		
	2- Mazagão	25 (10x20)	52	54	4,97	1,98	0,061		
	3- Ilha do Pará	12 (10x20	91,7	112	4,64	1,53	0,211		
	4- Macapá	50 (10x20)	28	37	4,66	2,87	0,087		

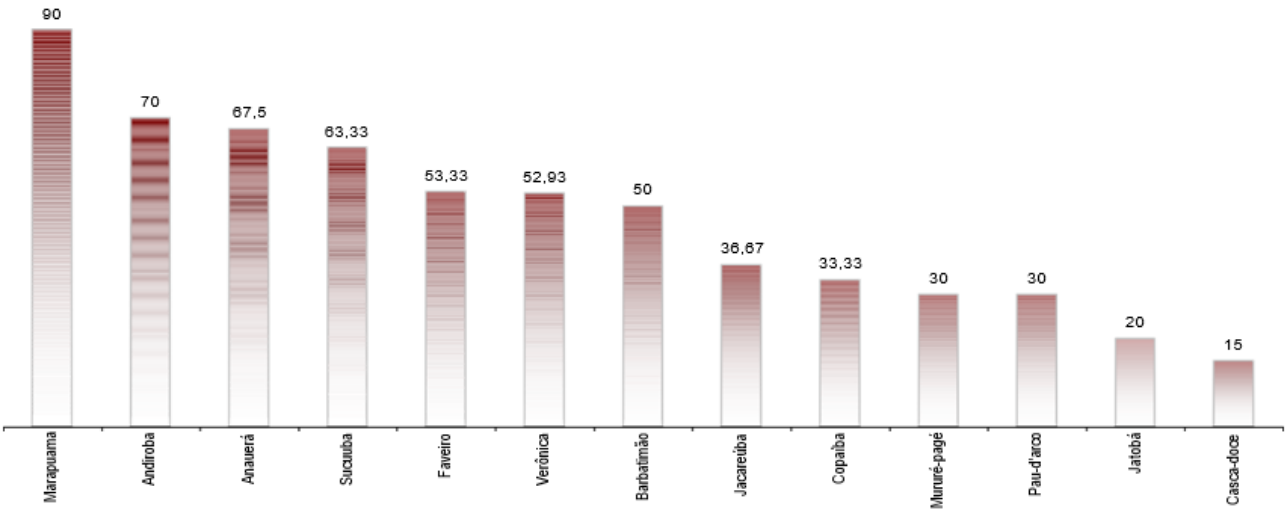
AF: absolute frequency; DA: absolute density; DBH: diameter at chest height; AB: basal area.

ABUNDANCE STRUCTURE

Abundance can refer to both the number of individuals in a population and the number of species in a community. In this study, for the estimation of species abundance, absolute frequency and density were defined as parameters.

Absolute frequency (FA) is understood as the number of sampling units that a given species occupies (PIRES-O'BRIEN; O'BRIEN, 1995) and is used to express its distribution in the area (RABELO et al., 2001). According to Ferreira et al. (1997), three classes were defined: 1) common—present in almost all plots; 2) regular—present in 50% of the installments; and 3) rare—with occasional presence in the plots. Thus, the following were considered common species: marapuama, andiroba, anauerá and sucuuba; Regulars: Faveiro, Verônica and Barbatimão; and rare: jacareúba, copaiba, mururé-pagé, pau-d'arco, jatobá and casca-doce (Figure 2).

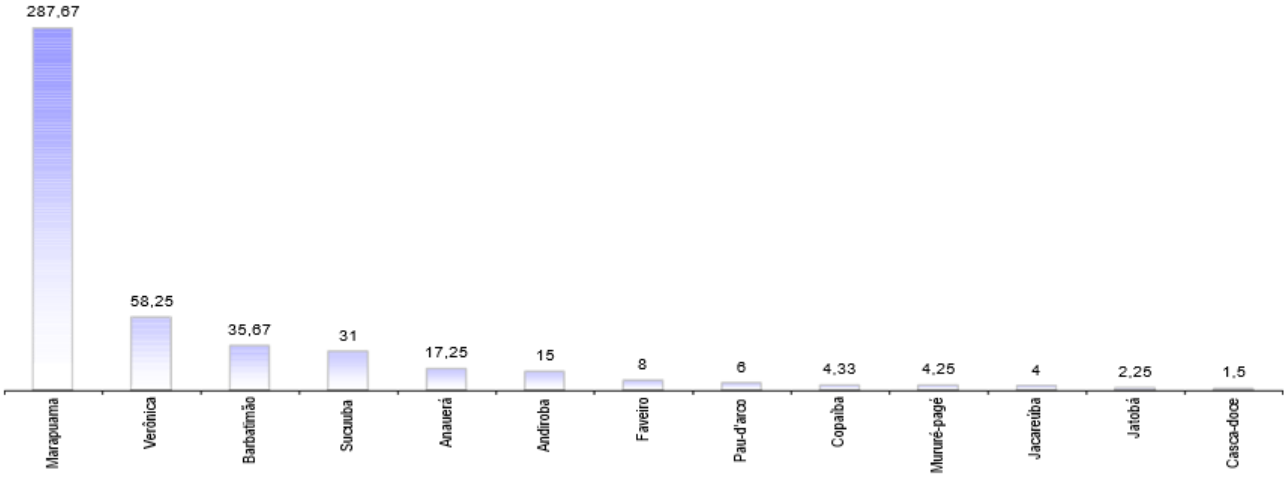
Figure 2: Absolute frequency of species (mean, %).



Absolute density is commonly defined as the number of individuals of a given species, per unit area (PIRES-O'BRIEN; O'BRIEN, 1995) and explains characteristics such as absence and rarity. In relation to this parameter, the species were defined as: rare —with an average of 1 to 4 individuals per hectare; intermediate — with between 5 and 39 individuals per hectare; and abundant —with

more than 39 individuals per hectare (LISBOA et al., 1997). Thus, the following were considered abundant: marapuama and veronica; intermediate: barbatimão, sucuuba, anauerá, andiroba, feveiro and pau-d'arco; and rare: copaiba, mururé-pagé, jacareúba, jatobá and casca-doce. (Figure 3). It should be noted that, in the survey, no minimum height or diameter were defined.

Figure 3: Distribution of average absolute densities of species (in terms of individuals per hectare).



SIZE STRUCTURE

The size structure is expressed by DBH and/or height. Tree species in a state of dynamic equilibrium generally have an inverted J-shaped frequency distribution , decreasing from a lower DBH size class or height to another of higher size (ARAGÃO et al., 1997).

Figures 4 to 16 show the distributions of species by DBH classes. The species that were presented as in equilibrium, whose distribution forms an inverted J, were: anauerá, although irregularly, barbatimão, marapuama, sucuuba and veronica. Andiroba, copaiba, jatobá, mururé-pagé and pau-d'arco showed a distribution in which the largest number of individuals is concentrated in the classes of larger diameter. For sweet bark, faveiro and jacareúba the distribution was more or less random among the DBH classes.

Figure 4: Anauerá. Distribution by DBH classes.

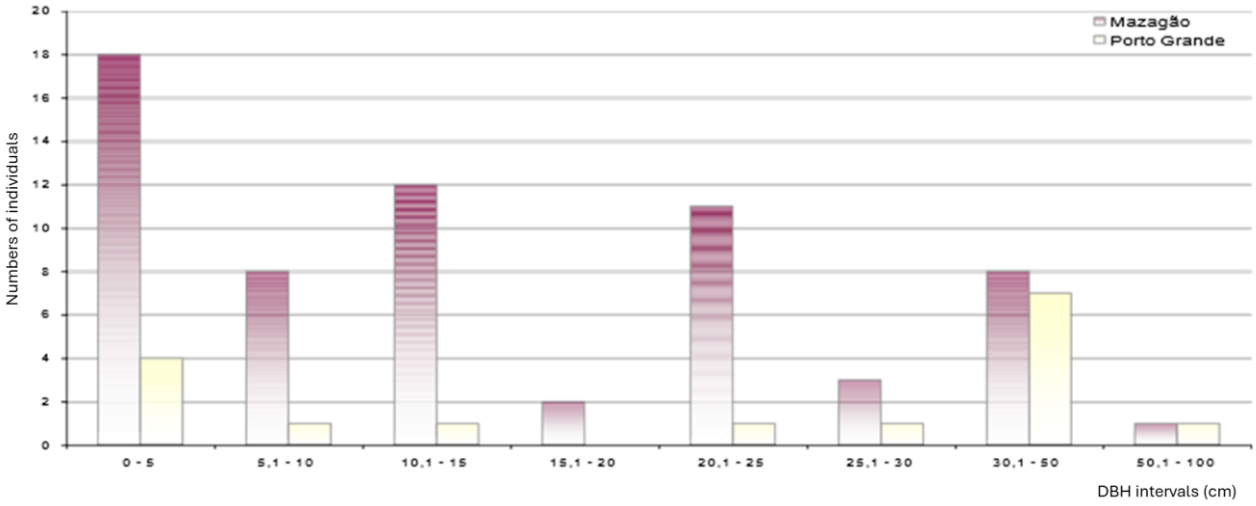


Figure 5: Andiroba. Distribution by DBH classes.

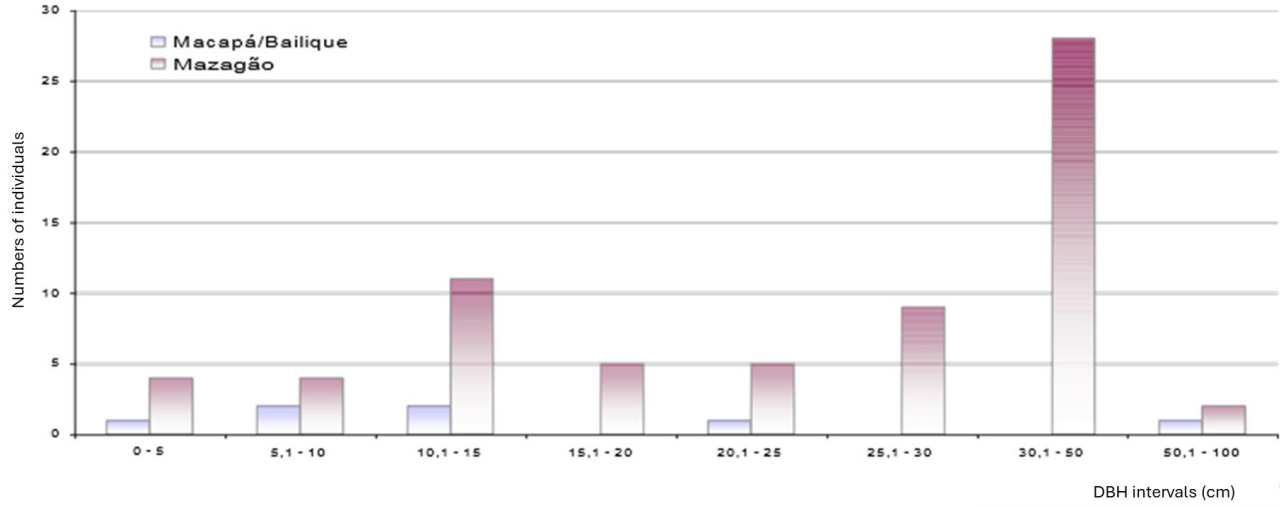


Figure 6: Barbatimão. Distribution by DBH classes.

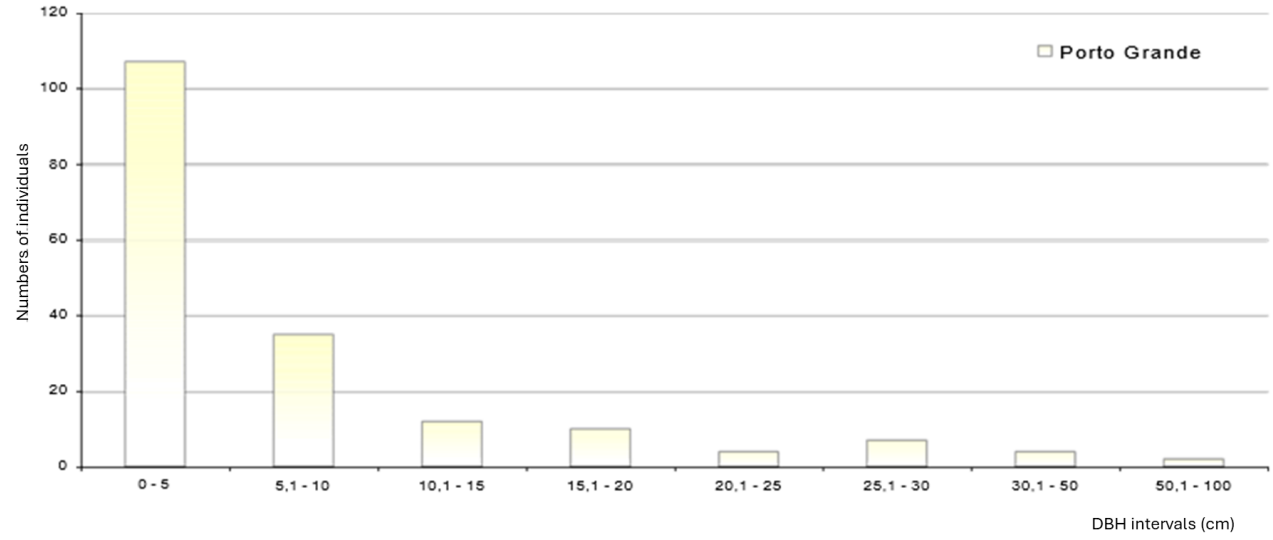


Figure 7: Sweet bark. Distribution by DBH classes.

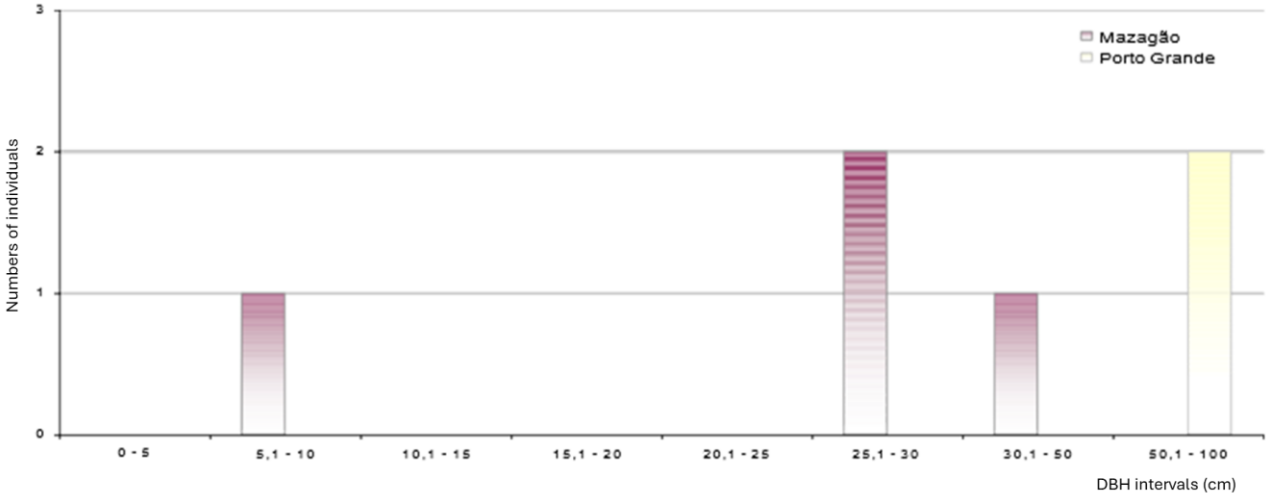


Figure 8: Copaiba. Distribution by DBH classes.

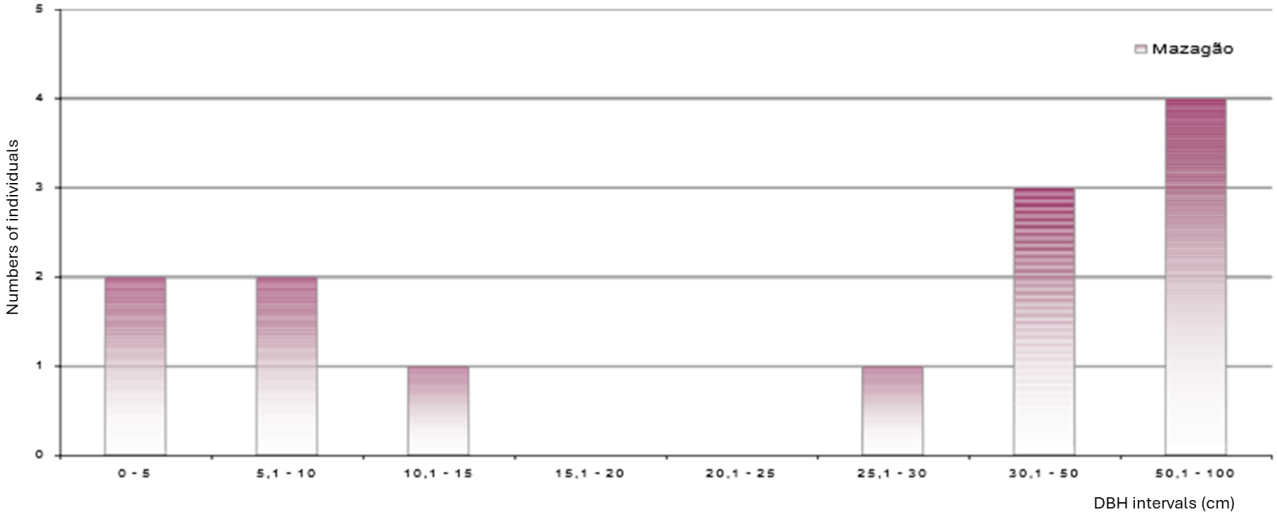


Figure 9: Faveira. Distribution by DBH classes.

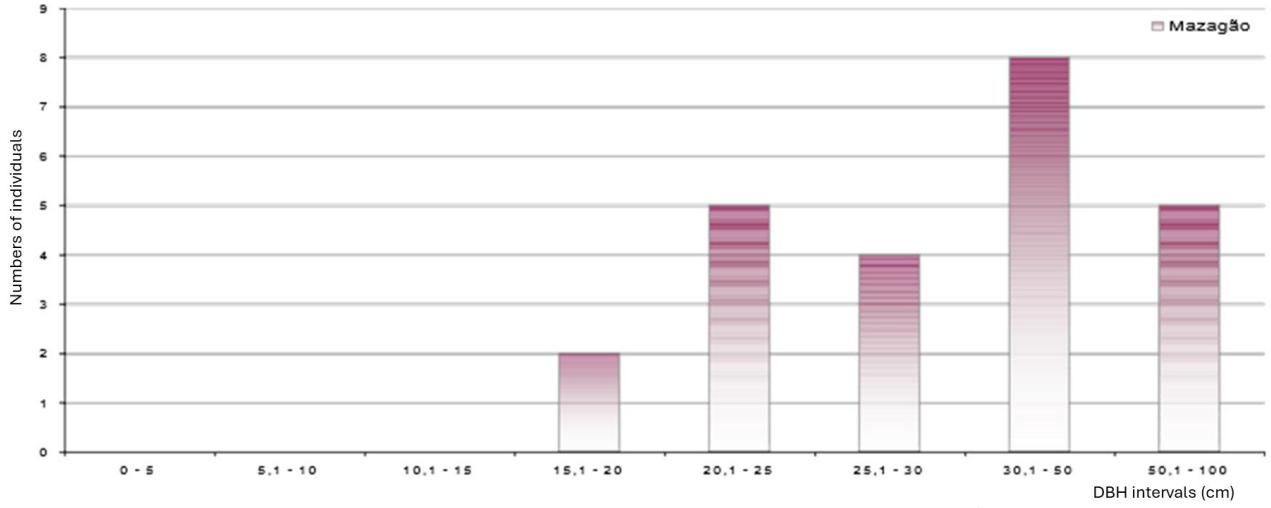


Figure 10: Jacareúba. Distribution by DBH classes.

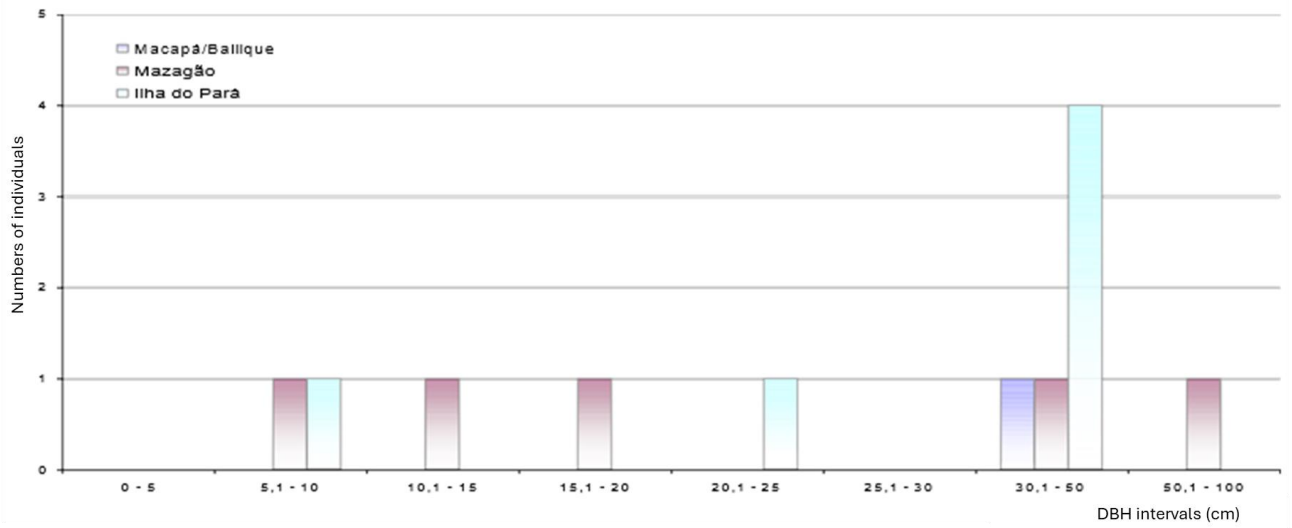


Figure 11: Jatobá. Distribution by DBH classes.



Figure 12: Marapuama. Distribution by DBH classes.

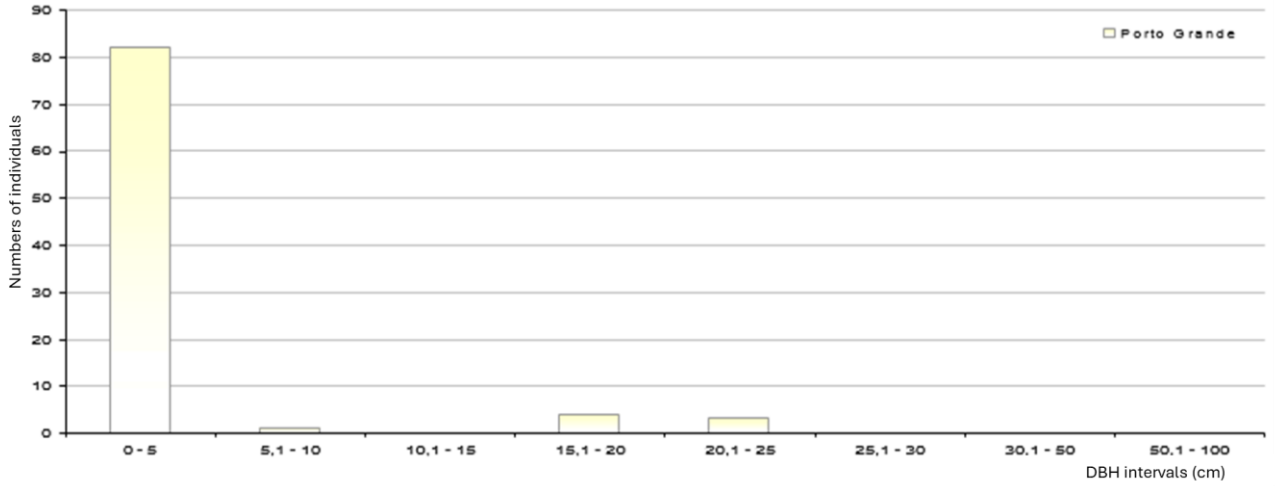


Figure 13: Mururé-pagé. Distribution by DBH classes.

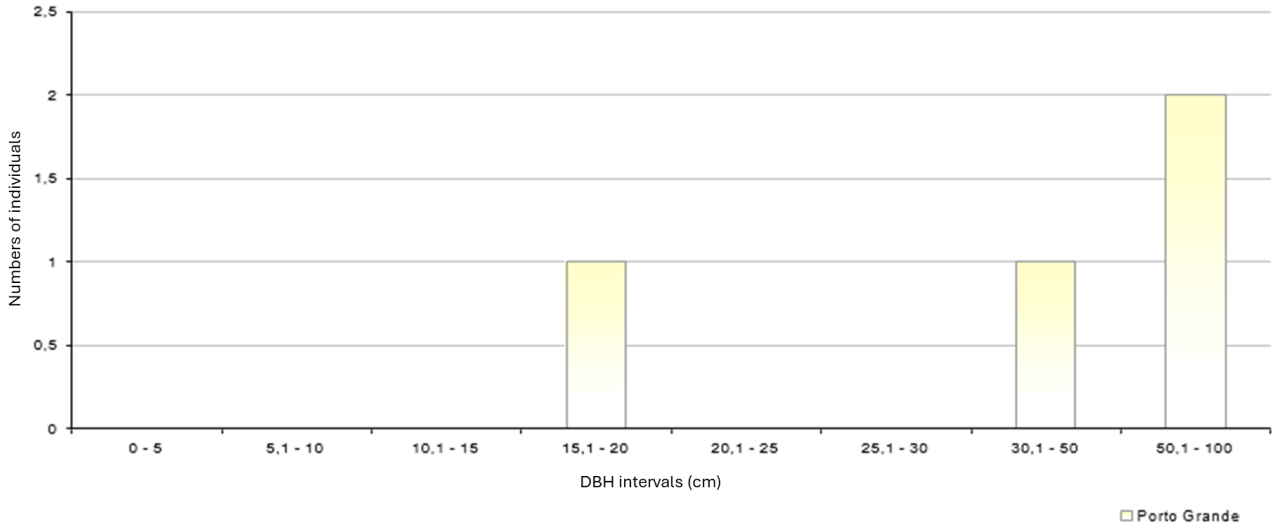


Figure 14: Pau-d'arco. Distribution by DBH classes.

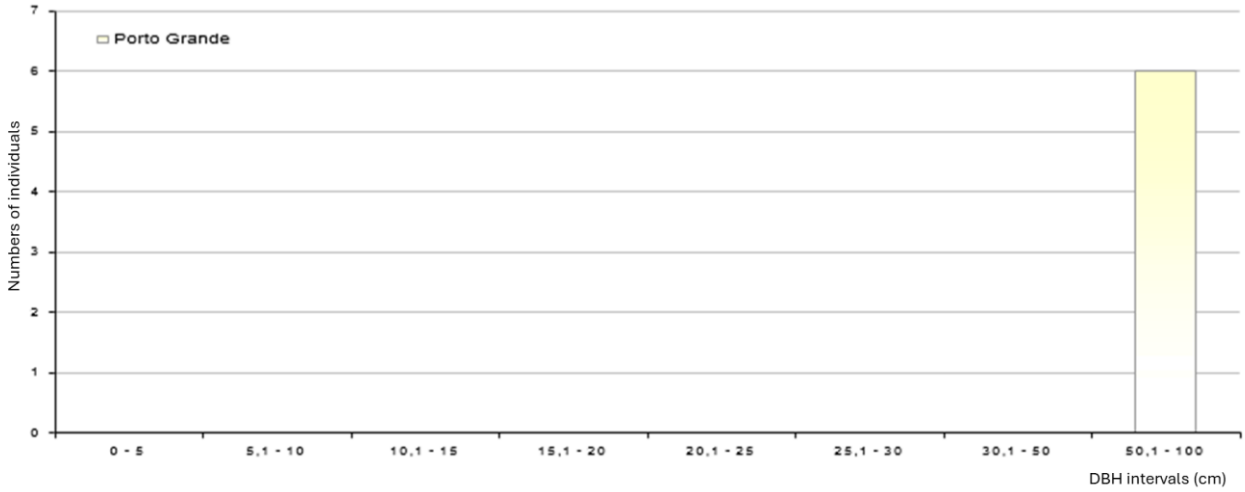


Figure 15: Sucuuba. Distribution by DBH classes. The class with the highest number of representatives was, in Porto Grande, from 0 to 5 centimeters.

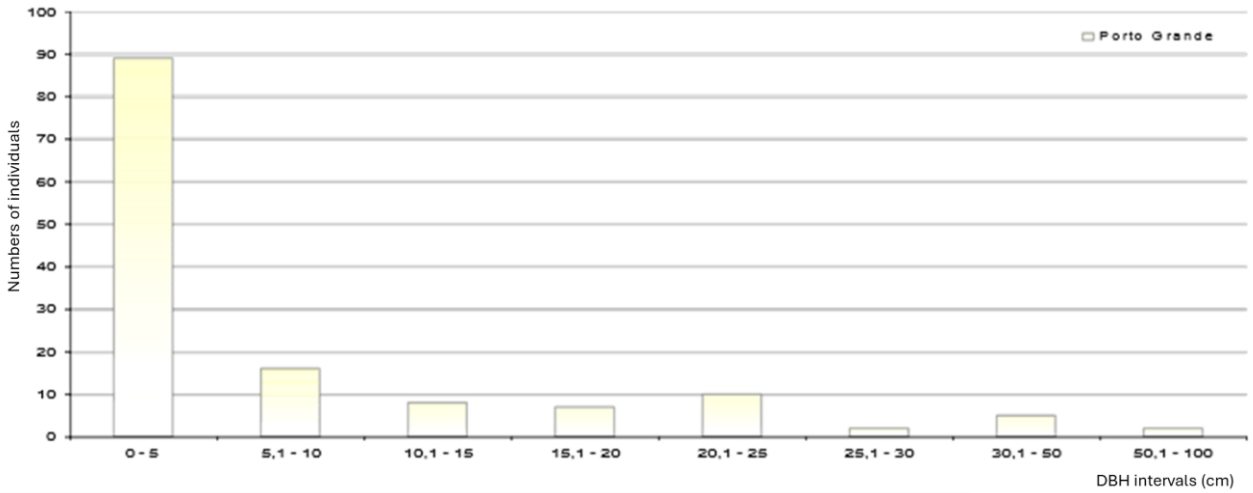
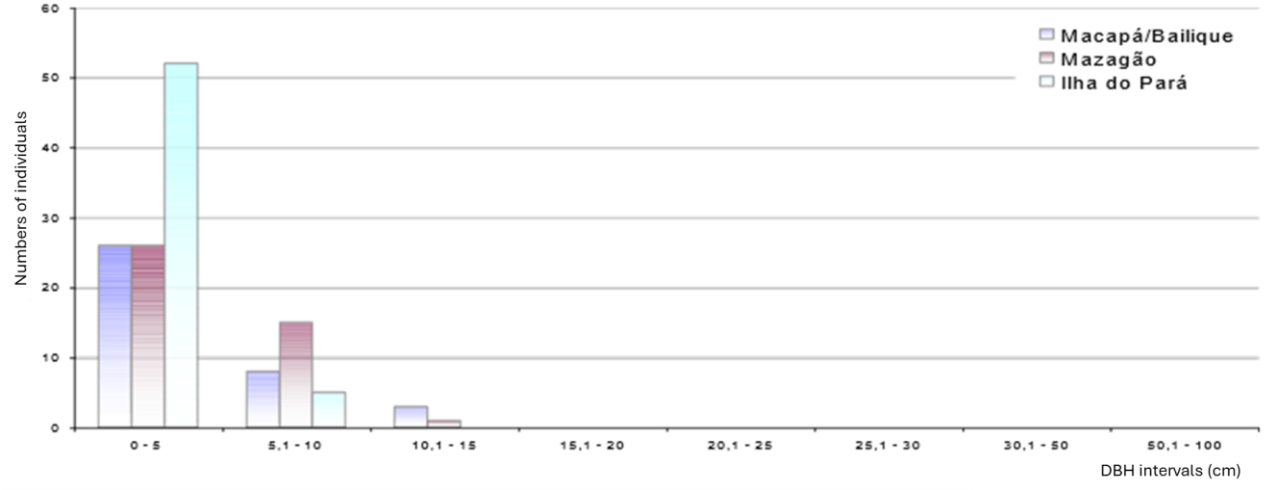


Figure 16: Veronica. Distribution by DBH classes. The class with the highest number of representatives was, on Pará Island, from 0 to 5 centimeters.



Figures 17 to 28 show the distributions of species by height classes. Anauerá presents the inverted **J** distribution more clearly in the inventories of Mazagão; the same happens with jatobá, but the curve starts from the fifth class (21 to 25m); andiroba, faveiro and jacareúba present a similar distribution pattern, in which there is a concentration of individuals in the central classes; casca-doce, copaíba and mururé-pagé are distributed in such a way that some classes are left without representatives; for barbatimão, Marapuama and Sucuuba individuals are concentrated in the first height class (0 to 5m); and all the individuals of pau-d'arco are between 31 and 40m.

Figure 17: Anauerá. Distribution by height classes.

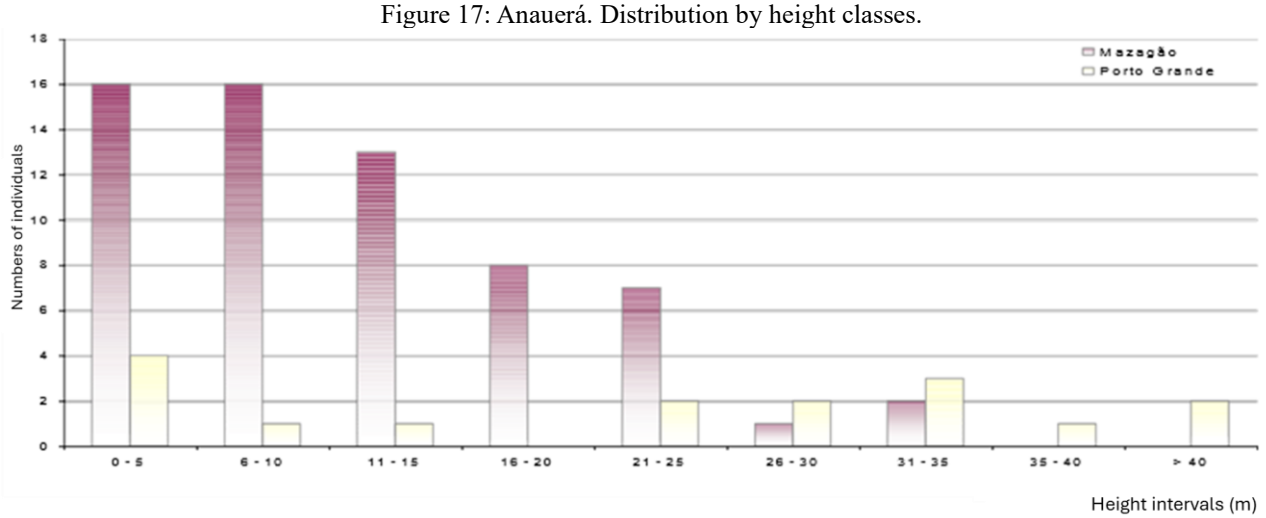


Figure 18: Andiroba. Distribution by height classes.

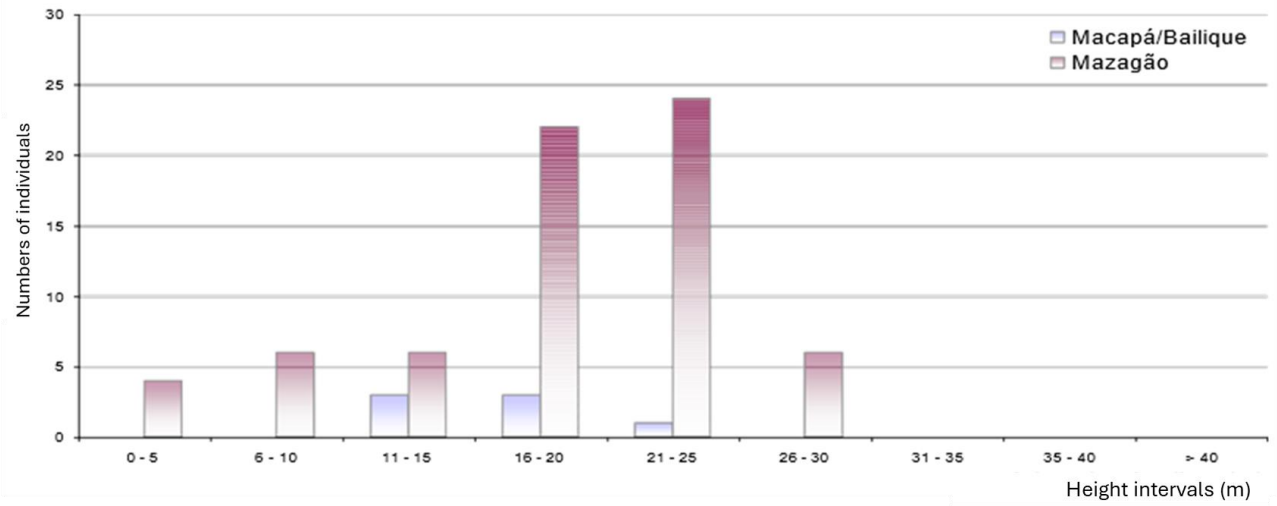


Figure 19: Barbatimão. Distribution by height classes

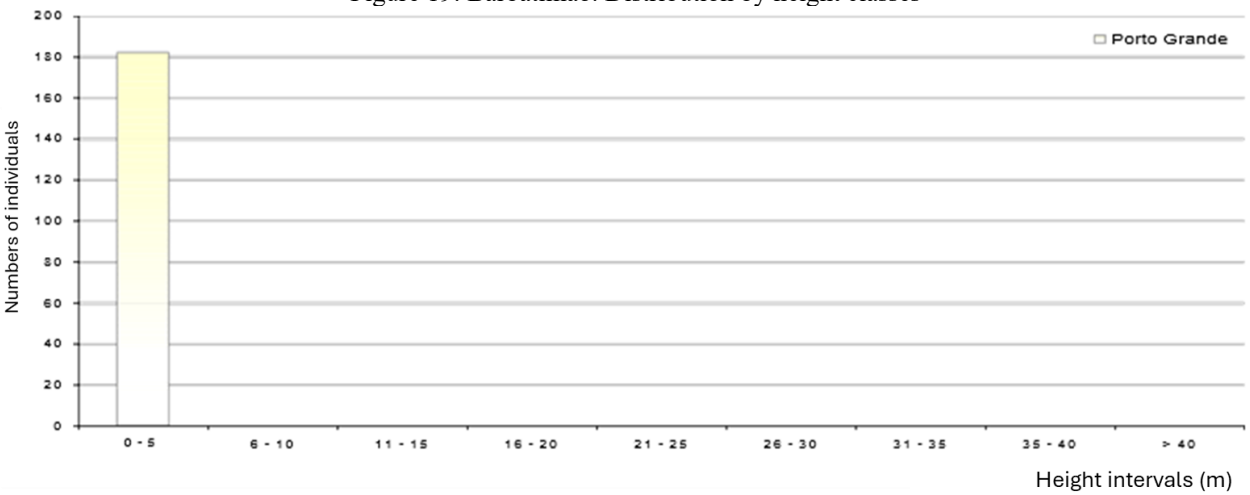


Figure 20: Sweet bark. Distribution by height classes.

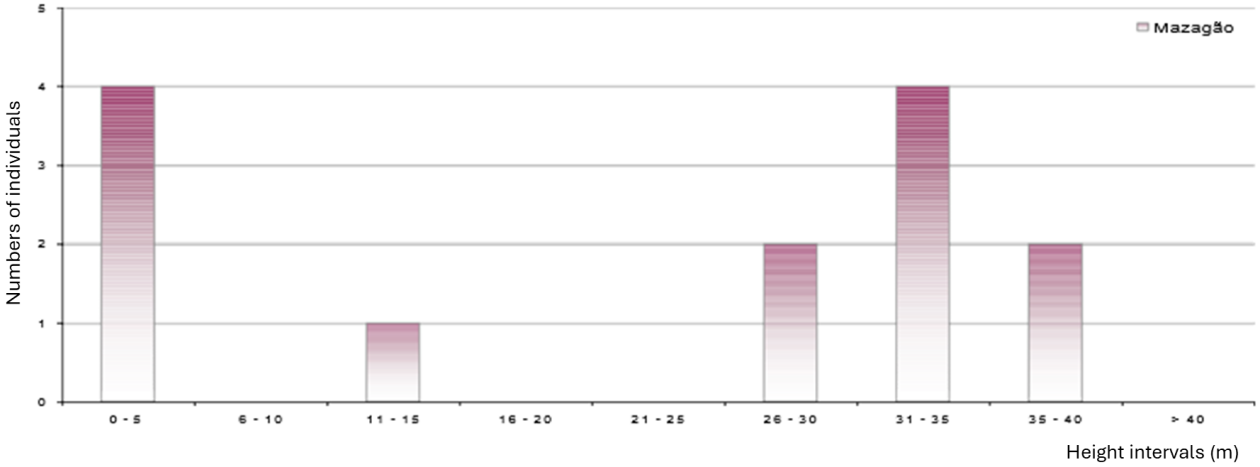


Figure 21: Copaiba. Distribution by height classes.

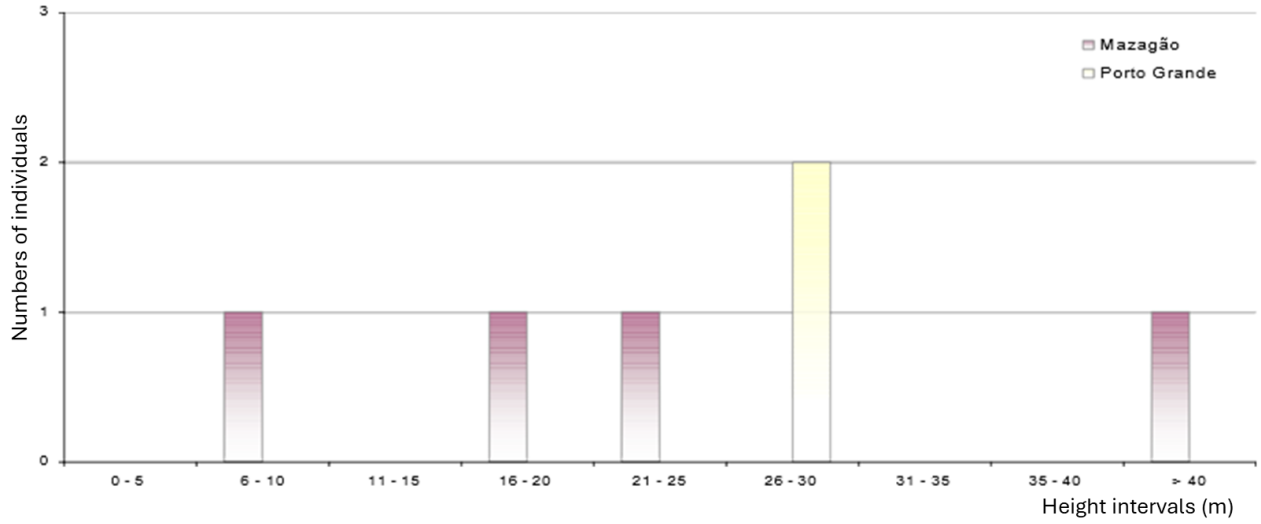


Figure 22: Faveira. Distribution by height classes.

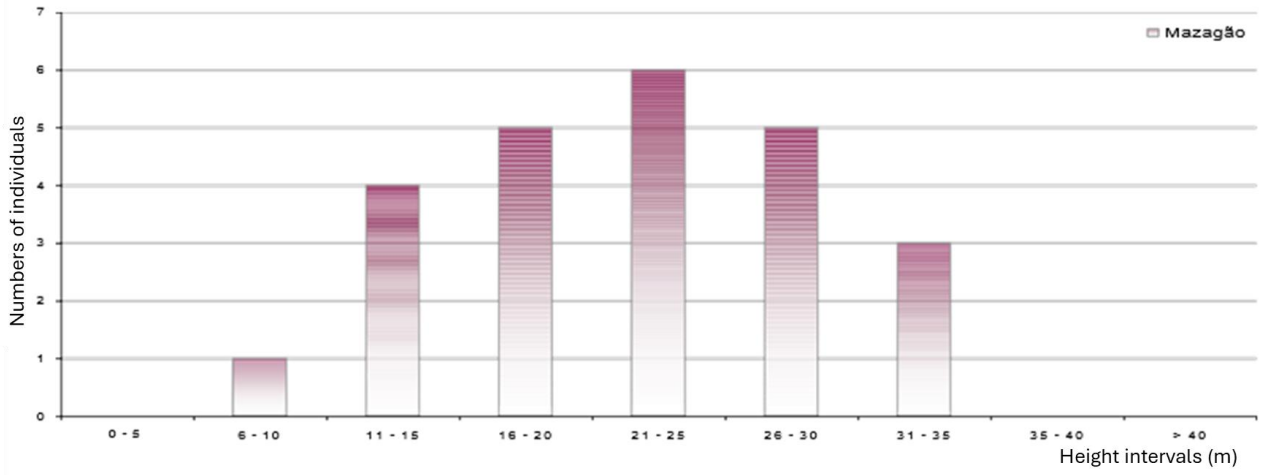


Figure 23: Jacareúba. Distribution by height classes.

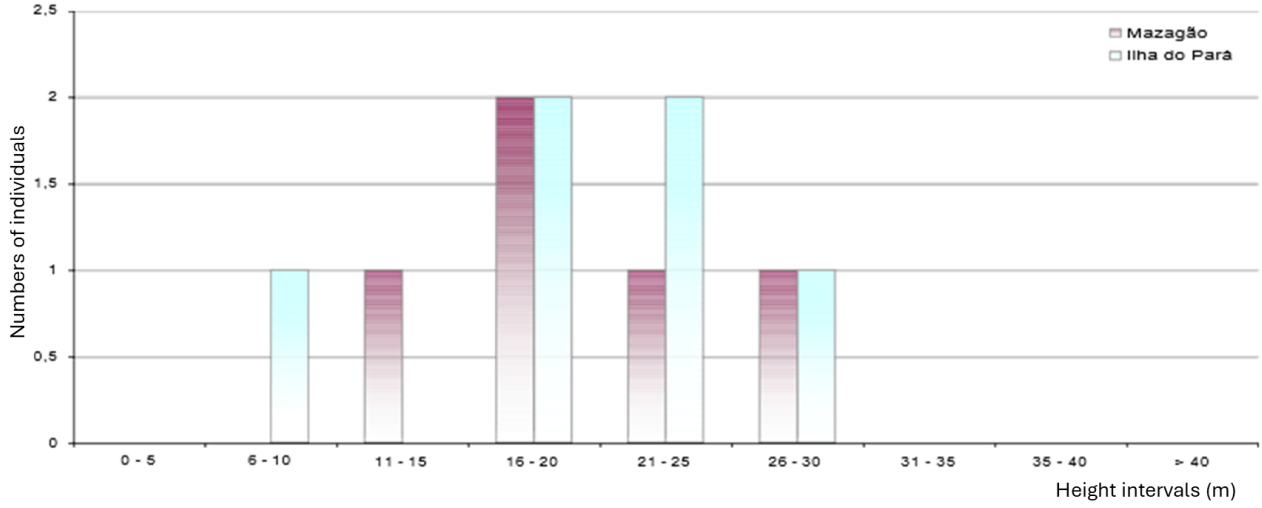


Figure 24: Jatobá. Distribution by height classes.

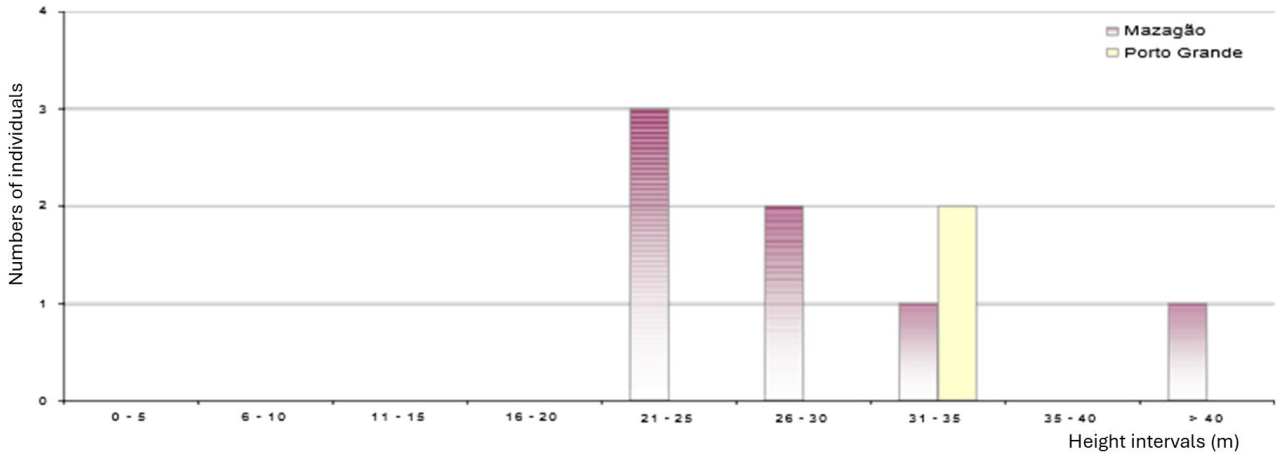


Figure 25: Marapuama. Distribution by height classes.

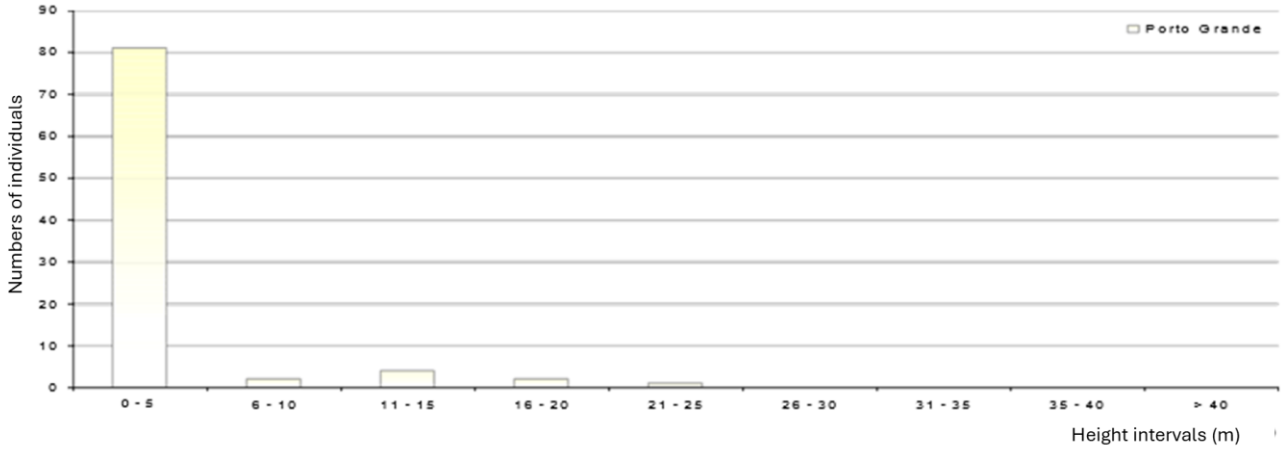


Figure 26: Mururé-pagé. Distribution by height classes.

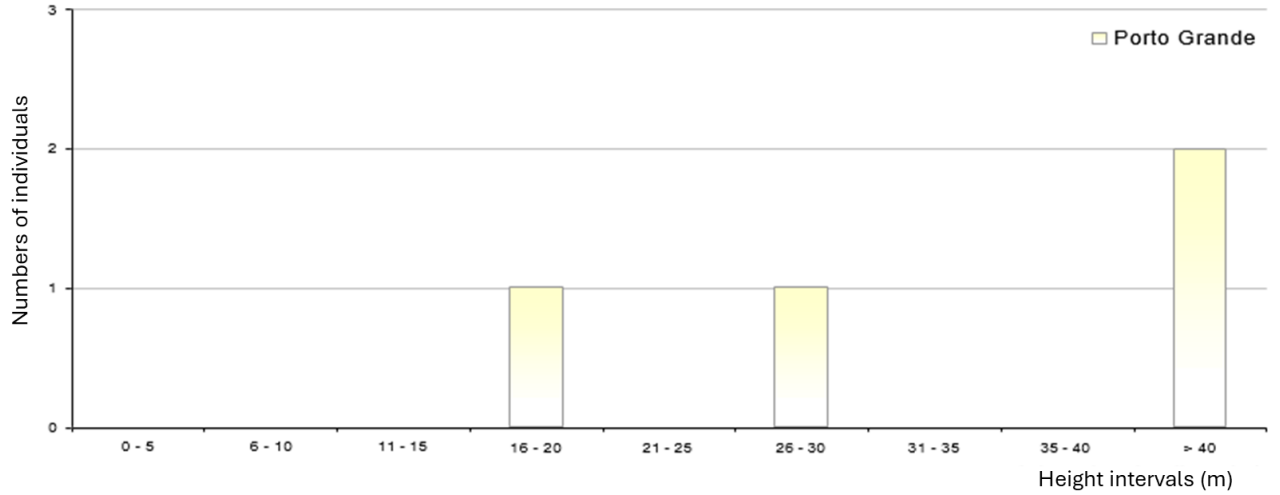


Figure 27: Pau-d'arco. Distribution by height classes.

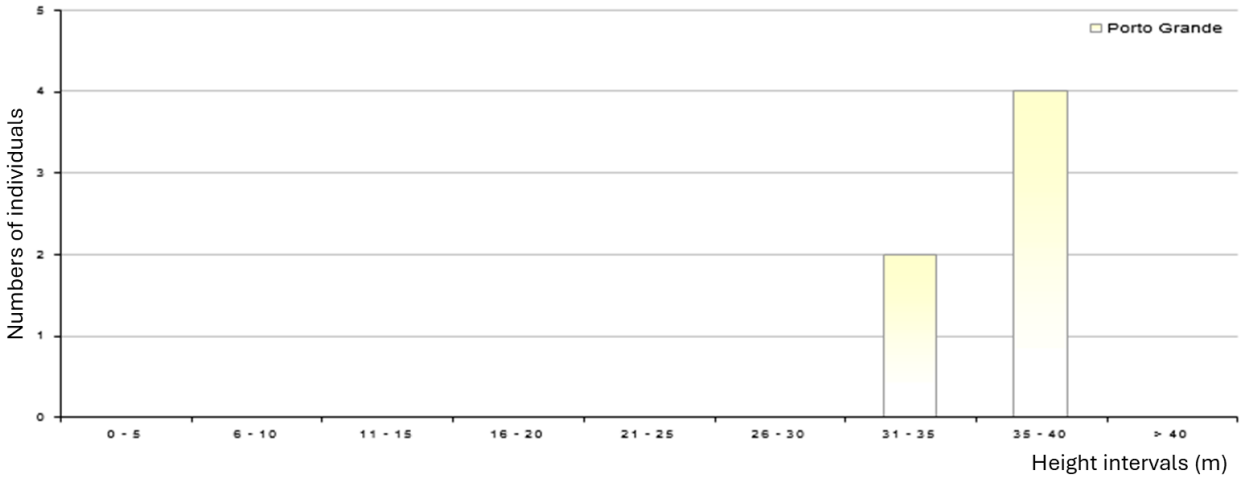
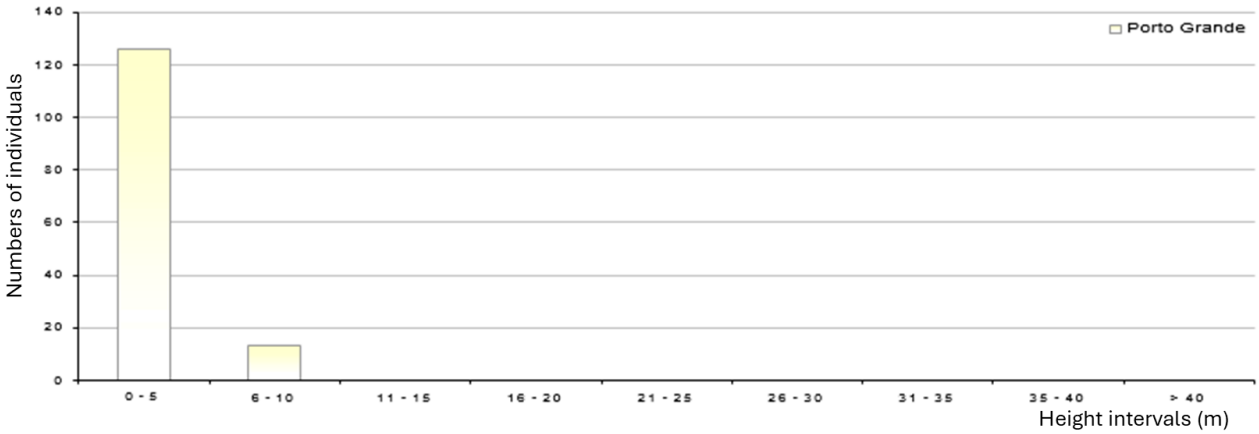
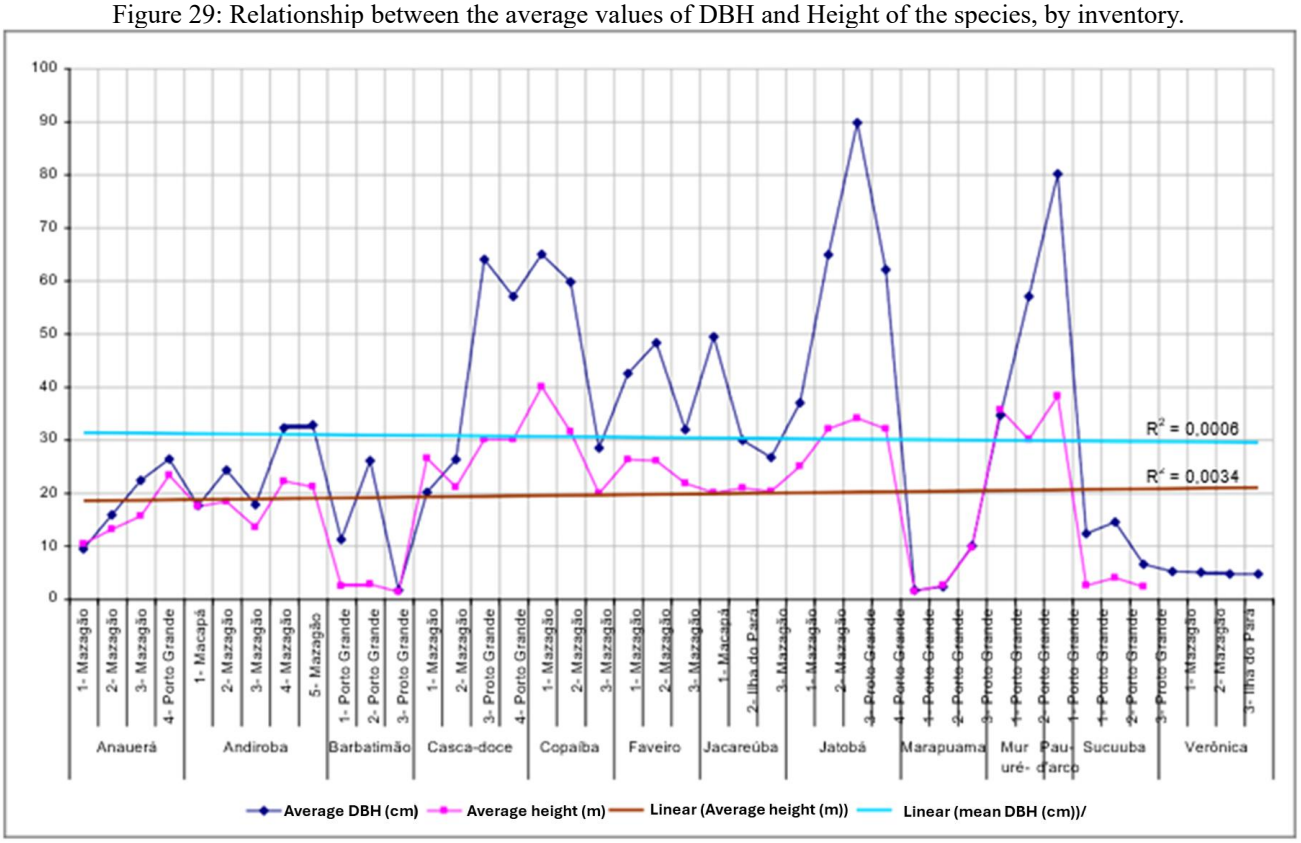


Figure 28: Sucuuba. Distribution by height classes.



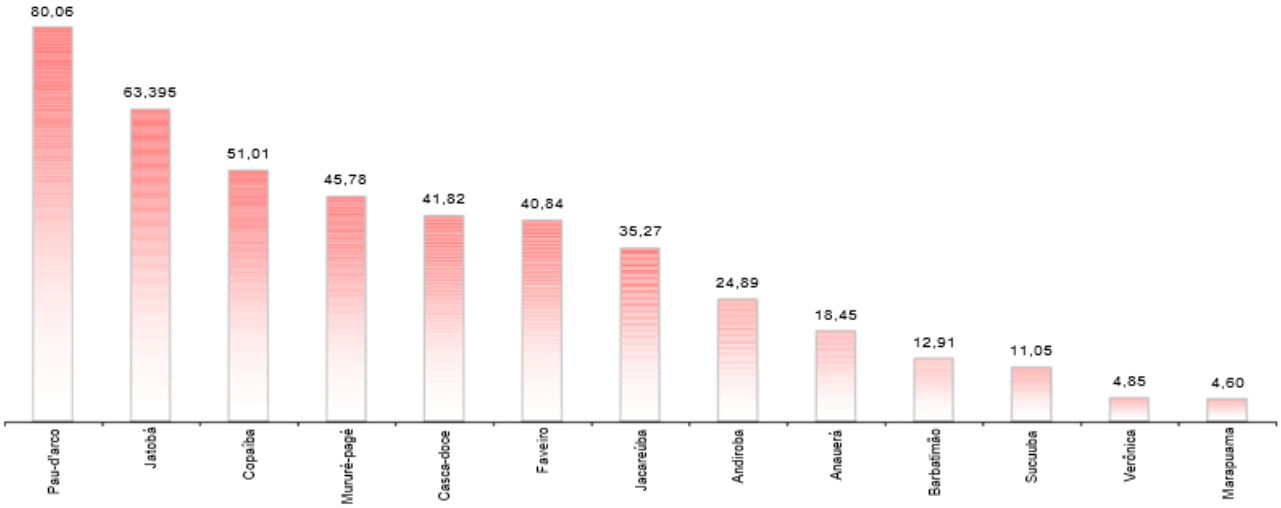
In figure 29, where the average values obtained for each inventory are shown, there is a tendency for correspondence between the diameter and height of the species, indicating their size and, indirectly, the amount of raw material available, although it is necessary to analyze other factors inherent to the part of the plant used in production.

Figure 29: Relationship between the average values of DBH and Height of the species, by inventory.



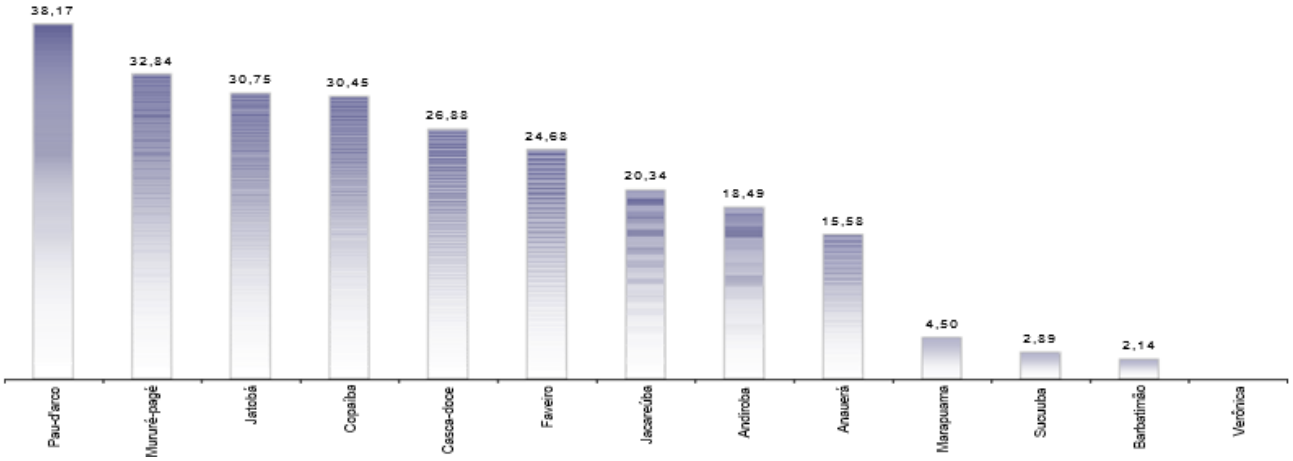
In the calculation of the DBH, individuals with very low values decreased the average of the species. Thus, the largest diameters were obtained for pau-d'arco, jatobá, copaiba, mururé-pagé and casca-doce, with values greater than 40cm (Figure 30).

Figure 30: Mean DBH values (cm).



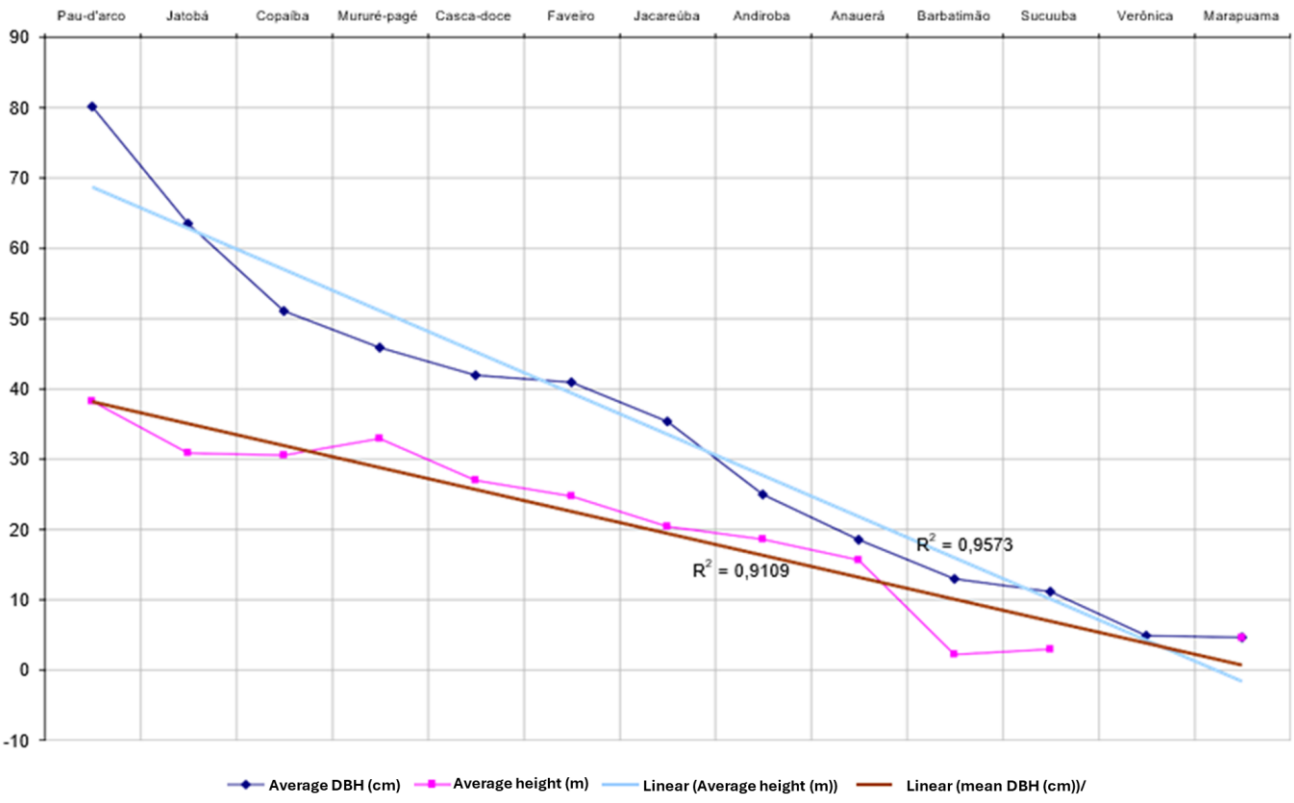
The highest heights were measured for pau-d'arco, mururé-pagé, jatobá, copaiba and casca-doce, all with an average greater than 25m (Figure 31).

Figure 31: Average heights of the sampled individuals (m).



The relationship observed in the inventories (shown in figure 35), for DBH and Height, is maintained in the analysis of the general averages obtained for the species, as shown in figure 32.

Figure 32: Relationship between average DBH and average height of the species.



From the analysis of the measured parameters, it can be inferred that the species with the greatest potential for extraction are: anauerá, andiroba, copaíba, faveira and verônica, as they are represented in almost all classes, both DBH (Figures 4, 5, 8, 9 and 16) and height (Figures 17, 18, 21 and 22). Although it has a low frequency (Figure 2) and density (Figure 3), the scale and form of extraction of copaiba oil gives a certain tranquility to its use.

On the other hand, the following inspires greater care regarding exploitation: casca-doce, mururé-pagé, jatobá, pau-d'arco, which are present in low frequency and density (Figures 2 and 3, respectively) and which are almost not represented in the initial size classes, which indicates a low regeneration rate for these species. Cases are jacareúba, which despite being represented in almost all size classes (Figures 10 and 23), is present in low density (Figure 3), and marapuama, which, despite the indication of having a good increase (Figures 12 and 25), the form of extraction definitively compromises the young individual, from which the root is removed.

Barbatimão and sucuuba, because they are shrub species, or are small trees, and veronica, which is a liana, deserve an analysis considering DBH classes and height different from the others.

CONCLUSIONS

The results of this research are important because they indicate that, in order to produce more significant information on stock, it is necessary to expand the inventory areas, making a greater coverage of the state, and to determine, in a more precise way, the demand for the vegetable raw material. It is also recommended to carry out more specific studies involving, for example, floral biology, spatial distribution, population structure, growth, regeneration, recruitment and biomass estimation. In this way, it will be possible to expand the range of information on the species used by the IEPA and give greater security to their exploitation in the natural environment.

ACKNOWLEDGMENT

The authors would like to thank Banco da Amazônia for financing the project *Botanical/Ecological Study and Qualitative Analysis of Extractive Medicinal Species Used in the Production of Herbal Medicines and/or Phytocosmetics by IEPA*; IEPA for supporting the trips; technicians Lindomar Chagas, Jonas Cardoso and Antônio Viana for helping with fieldwork; and local residents, who guided us in the areas visited.

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Biopsychosocial impacts of alcohol abuse: Integrative review

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Aline Souto Ribeiro[1], Beatriz Majella Binato[2], Danielle Galdino de Paula[3] and Raisa Duarte da Silva Ribeiro[4]

ABSTRACT

Based on the premise that alcohol use is a complex, multifactorial issue of great relevance to society, it is understood that there is no simple and universal answer that can account for all the problems involved in drug use and arising from it. To identify and analyze biopsychosocial factors in alcohol users, an integrative review was carried out based on articles available in the VHL online search portals, being listed: PubMed and Scielo. The initial search identified 202 publications on the subject, and 18 articles that met the objectives of the study were listed, based on the inclusion criteria. The lexical analyses, carried out with the Iramuteq® program, highlighted the proximity between words and classes, evidencing a significant distribution in the textual corpus, revealing two groups: Group 1: Biopsychosocial factors and alcohol consumption: behaviors associated with gender and age group and; Group 2: Early alcohol consumption: early approach x long-term consequences. The reviewed studies demonstrate a greater association with risk behavior and psychological disorders in women who use alcohol and; abusive consumption of alcohol experienced by children and adolescents, with this problem having a direct relationship with culture and social context.

Keywords: Adult, Alcohol Consumption, Alcohol Abuse Disorder, Biopsychosocial Models, Alcohol Use Disorders.

[1] Highest degree: Undergraduate student in nutrition
Academic institution: Federal University of the State of Rio de Janeiro - UNIRIO
[2] Highest degree: Undergraduate student in nutrition
Academic institution: Federal University of the State of Rio de Janeiro - UNIRIO
[3] Highest degree: Doctor of Nursing.
Academic institution: Federal University of the State of Rio de Janeiro - UNIRIO
[4] Highest degree: Doctor in Contemporary Legal Theories
Academic institution: Federal University of the State of Rio de Janeiro - UNIRIO

INTRODUCTION

In recent years, a growing number of studies on the challenges and care related to individuals who use alcohol and other drugs have resulted in a greater understanding of the health care needs of these population groups and the challenges they face in achieving/maintaining good health and access to care. However, many gaps in knowledge remain, particularly related to the biopsychosocial impacts on alcohol users (Khamis et al., 2022)

As it is a substance allowed in Brazil, a challenge for health professionals is to be able to define the boundaries between habitual and problematic consumption, since the intake of alcoholic beverages is a complementary part of social life. Thus, to study the topic of alcohol is also to present a context about society, since the act of drinking is a social act. This is because human beings have always sought, over time, ways to increase their pleasure and reduce their suffering. (BASTOS et al. , 2017) (Borges; Lyra; Diniz, 2019)

There are two universal systems used to define problematic conditions in relation to alcohol use. The International Classification of Diseases (ICD-11), made by the World Health Organization (WHO), differentiates 'episode of harmful use of alcohol', 'pattern of harmful use of alcohol' and 'alcohol dependence', and, in this order, represent an increasing progression of alcohol intake. (WHO, 2024)

Alcohol and other drug abuse has adverse consequences, including physical and mental health problems. Adherence to treatment can be hampered by personal resistance and inadequate support from health services. Despite the socialization character, the consumption of alcoholic beverages, when abusive, can generate social problems. Thus, more than the proposition of prescriptive strategies, it is necessary to develop protection, prevention and welcoming mechanisms that support users in a situation of dependence through interventions that encourage healthy and quality life choices, demystifying the false idea of autonomy provided by psychoactive substances (de Faria et al., 2024) (Moura et al., 2018)

It can be said that the biopsychosocial impacts on the life of alcohol users is a complex subject that is not yet fully understood. Therefore, this study aims to identify and analyze biopsychosocial factors in alcohol users through an integrative review, so that, later, the authors can assist in the search for existing gaps in scientific knowledge.

METHODOLOGY

The present study is an integrative literature review carried out in six stages. This type of review allows for a broad understanding of the subject, with the objective of gathering and synthesizing scientific information in a systematic way on a given topic (Mendes; Scott; Galvão, 2008)

The review protocol is registered in the OSF Registries under link DOI 10.17605/OSF.IO/XM76Q.

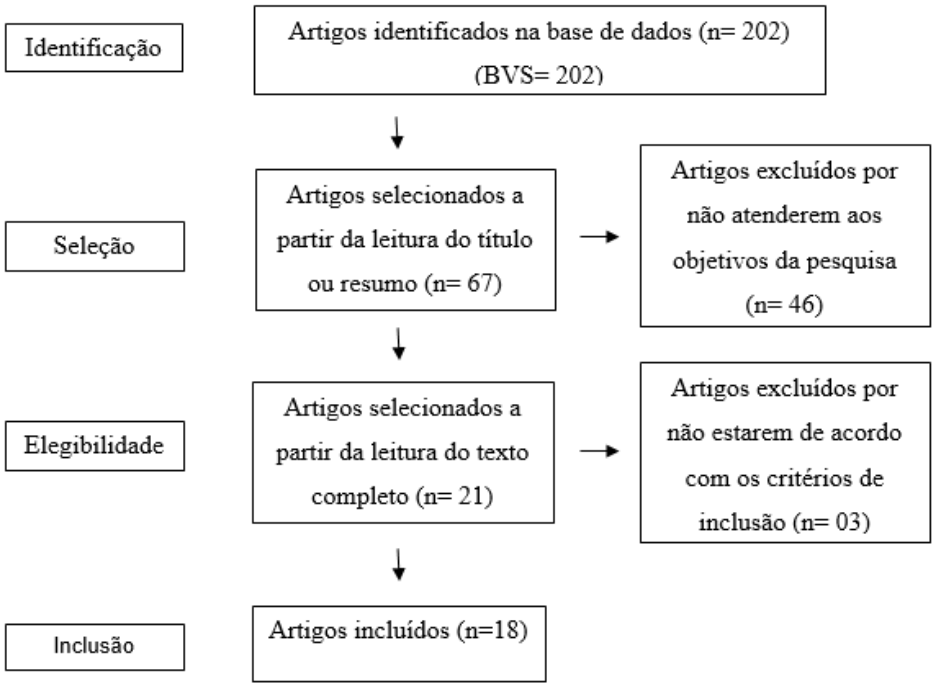
The research protocol was outlined, guided by the research question, which was built based on the mnemonic PCC, whose Population (P) = adult individuals; concept (C) = alcohol users; context (C) = biopsychosocial impact.

Based on the PCC acnemonic acmnemonic, the following research question was asked: What are the biopsychosocial impacts on alcohol users reported in scientific articles?

The search was carried out in April 2024 by two independent researchers with the descriptors defined by the PCC mnemonic, from the Health Sciences Descriptors (Decs/Mesh) portal, used in isolation and combined through Boolean operators "AND" and "OR". The searched database was carried out through the Virtual Health Library (VHL). Thus, the identified articles were compiled from the Latin American and Caribbean Literature on Health Sciences (LILACS) and Medical Literature Analysis and Retrieval System Online (MEDLINE). To obtain access to the articles, the Capes Journal Portal and the Federated Academic Community service (Capes Cafe) were used. Mendeley® software was used as a reference management tool.

In the second stage of the research, inclusion and exclusion criteria were defined. Full articles published in journals with human limit criteria, referring to the period from 2019 to 2024, in Portuguese, English, and Spanish, whose study population was composed of individuals aged 18 years or older and alcohol users, were included. Texts that are not scientific articles, review articles, prevalence articles, and studies with the child population were not included in the selection. Figure 1 shows the article selection process.

Figure 1. Flowchart of the process of identification, selection, election, and inclusion of articles, Rio de Janeiro, RJ, Brazil, 2024.



Source: authorship.

In the third stage, the authors prepared a table containing the main information of the selected articles. Thus, a database was created with the title of the article, year of publication, journal of publication, and objective of the study (Chart 1).

In the fourth stage, the level of evidence of the studies was independently assessed by three researchers. The level of evidence was defined as follows: Level I: meta-analysis/systematic review; II: randomized controlled clinical trial; III: controlled clinical trial without randomization, IV: well-designed case-control or cohort study; V: systematic review of qualitative and descriptive studies, VI: descriptive or qualitative studies, and VII: opinion of authorities or expert reports. The results of this screening are shown in Chart 1.

Table 1. Summary of the articles listed according to title, journal of publication, year of publication and level of evidence, Rio de Janeiro, RJ, Brazil, 2024.

Article Title	Journal and year of publication	Objective of the study	Level of evidence
The Course of Cognitive Performance during Inpatient Treatment in Patients with Alcohol Use Disorder with No, Mild or Major Neurocognitive Disorders (Bruijnen et al., 2021)	Alcohol and Alcoholism, 2021	OBJECTIVE: To investigate the course of cognitive performance and everyday cognitive functioning in patients with alcohol use disorder (AUD) who were admitted to a specialized center.	VI
Longitudinal changes in alcohol use and binge-drinking among young-adult	Addictive Behaviors,	highlight the importance of longitudinal research on	IV

college students: Analyses of predictors across system levels (Haardörfer et al., 2021)		alcohol use behaviors among young college adults, emphasizing the need to identify risk factors and guide interventions to reduce binge drinking.	
Latent Profile Analysis of Heavy Episodic Drinking in Emerging Adults: A Reinforcer Pathology Approach (Minhas et al., 2020)	Volume 112,	To focus the study on heavy episodic alcohol consumption (HED) in emerging adults (18 to 25 years), investigating its diversity in concomitant use of other substances and psychopathology.	VI
Use of alcohol and other psychoactive substances by university psychology students (Pires et al., 2020)	2021	to evaluate the pattern of use of alcohol and other psychoactive substances (SPAs) in university students.	VI
Adverse Childhood Experiences are Associated with High-Intensity Binge Drinking Behavior in Adulthood and Mediated by Psychiatric Disorders (Jung et al., 2020)		to investigate the relationship between adverse childhood experiences (ACEs) and high-intensity alcohol abuse (HIBD), with results suggesting an association between ACEs and HIBD, possibly mediated by psychiatric disorders.	VI
Sleep-related functional impairment as a moderator of risky drinking and subsequent negative drinking consequences in college students (Goodhines et al., 2019)		Investigating sleep impairment affects the relationship between risky drinking and negative consequences, highlighting the importance of considering sleep in research and interventions related to alcohol consumption in college students.	VI
Binge drinking in adolescence predicts an atypical cortisol stress response in young adulthood (Hagan et al., 2019)	Alcoholism: Clinical and Experimental Research, 2020	To examine the prospective effects of alcohol abuse during the adolescence on stress reactivity, as measured by cortisol, in young adulthood, especially in individuals who experienced parental divorce in childhood.	VI
Ethnicity in Substance Abuse Journal (Chomsri et al., 2019) **3.**	Psychology, Science and Profession, 2020	explore the prevalence of substance use, the level of risk, and psychosocial and behavioral factors, especially related to binge drinking.	VI
Differences in the relation of binge drinking and prescription drug misuse to suicide ideation and attempts between college-aged adults and adults above the age of 25: Findings from the 2015–2019 National Survey on Drug	Alcohol and Alcoholism, 2020	Clarify the role of age in the risk associated with drug misuse and excessive alcohol consumption.	IV

Use and Health (NSDUH) (Porter; Carrasquillo; Ashrafioun, 2024)			
Exploring the associations between serious psychological distress and the quantity or frequency of tobacco, alcohol, and cannabis use among pregnant women in the United States . (David et al., 2023)	Addictive behaviors, 2019	To examine the relationship between severe psychological distress and the amount or frequency of substance use among pregnant women in the United States.	IV
Mental health, substance use, and risky sexual behaviors among women living with HIV (Deaterly et al., 2023)	Psychoneuroendocrinology, 2019	To analyze a cohort of women living with HIV in Florida on the aspects of sexual behaviors, substance use, and mental health symptoms.	IV
Alcohol Misuse, Binge Drinking, and their Associations with Psychosocial Factors during COVID-19 among Harlem Residents in New York City . (Vu et al., 2023)	Journal of Ethnicity in Substance Abuse, 2019	To examine the prevalence of alcohol misuse and binge drinking and their associations with psychosocial factors such as substance use, severity of depression symptoms, and perception of community policing during COVID-19.	VI
Age- and Sex-Varying Associations Between Depressive Symptoms and Substance Use from Modal Ages 35 to 55 in a National Sample of U.S. Adults (Patrick et al., 2023)	Journal of Psychiatric Research, 2024	To examine associations between depressive symptoms and alcohol, cigarette, and marijuana use in US adults aged 35 to 55 years, overall and by sex.	IV
Past-month binge drinking and cannabis use among middle-aged and older adults in the United States, 2015–2019 (Kepner et al., 2023)	Preventive Medicine, 2023	To estimate national trends among older adults reporting binge drinking and cannabis use in the past month and to examine their correlations.	IV
Person-centered patterns of substance use during the COVID-19 pandemic and their associations with COVID-related impacts on health and personal finances in young Black and White women . (Chung et al., 2022)	Journal of nursing scholarship, 2023.	Identify subgroups with respect to substance use patterns before and during the COVID-19 pandemic and establish possible associations.	IV
Alcohol use associated with mental disorders in adult men (Molina et al., 2022)	Journal of Urban Health, 2023	To identify alcohol use in adult men and verify its association with socioeconomic and demographic factors and mental disorders	VI
Correlates of mild, moderate, and severe Alcohol Use Disorder among adults with problem substance use: Validity implications for DSM-55 (Mannes et al., 2021)	Prevention science, 2023	To examine clinical and functional characteristics as predictors (validators) of mild, moderate, and severe severity levels for alcohol use disorder, based on the DSM-5.	IV
Binge drinking among Hispanic older adults: 2015-2019 (Yockey, 2021)	Alcohol, 2023	To examine correlations with binge drinking among a national sample of older Hispanics.	IV

Source: authorship.

The fifth stage consisted of interpreting the results. Initially, a database was created with the methodology and the main results of the articles selected to run in the Iramuteq® program, which provided important tools for subsequent analysis.

Finally, in the sixth stage, the results were presented.

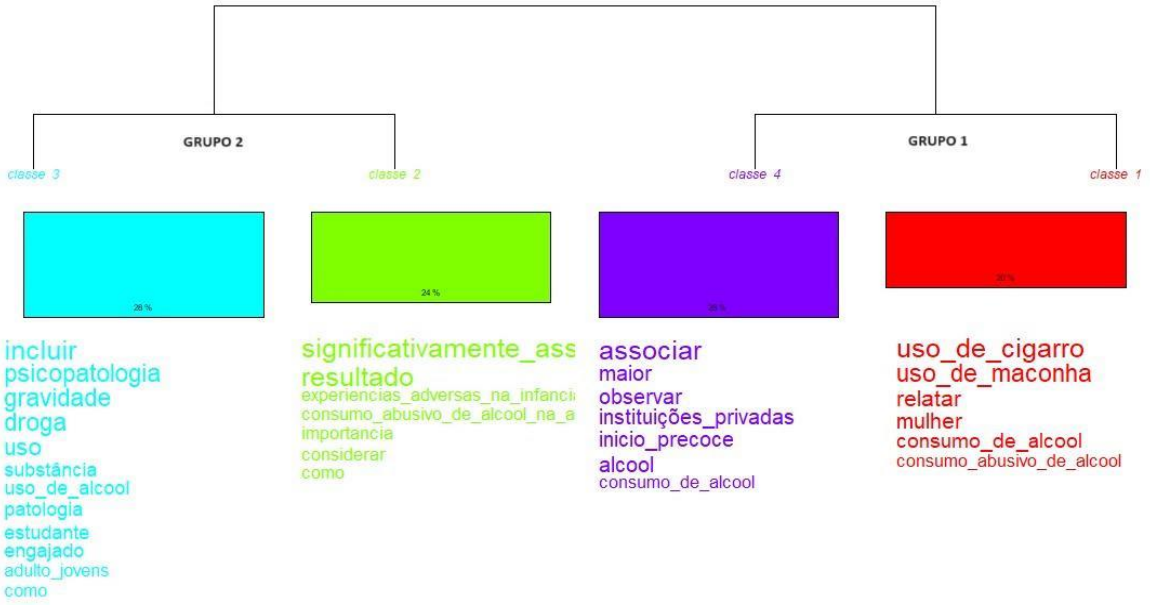
RESULTS

18 articles were selected, 16 articles (88.89%) in English and 2 articles (11.11%) in Portuguese. Of these, the publications are in 2023 (n=5, 27.78%), followed by 2021 (n=4, 22.22%), 2020 (n=3, 16.66%), 2019 (n=3, 16.66%), 2022 (n=2, 11.11%) and, finally, 2024 (n=1, 5.55%). Regarding the countries where the studies were published, there were 2 (11.11%) in Brazil, 1 (5.55%) in the Netherlands, 1 (5.55%) in Thailand and the remaining 14 (77.77%) in the United States, and 1 of these articles was also carried out in Canada.

Regarding the methodology used in the studies, 9 articles (50%) used the well-designed case-control or cohort method, 9 articles (50%) used the descriptive and qualitative methods. Regarding the level of evidence, it was noted the frequency of 9 articles at level IV: well-designed case-control or cohort study (n=9, 50%), 9 articles at level VI: descriptive or qualitative studies (n=9, 50%). Based on the studies listed, the Iramuteq® software was used to assist in the grouping of data. The general corpus consisted of 439 texts, separated into 18 text segments (TS) with a success rate of 58.89 ST (70.62%). In the present study, the corpus was divided into two *subcorpuses*. In the first, class 1 and 4 were obtained, which corresponded to 20% and 28% of the ECU, respectively. A second division into two *subcorpus* was constituted by classes 2 and 3 with 24% and 28% of the ECUs of the total corpus.

The CHD analysis of the active words produced four lexical classes divided into two large groups. Group A is formed by classes 1 and 4 and Group B was represented by classes 2 and 3. This result is demonstrated in the dendrogram, which also contains the list of the main active words by class. For each class, a list of words generated from the chi-square test ($\chi 2$) was computed. The words that had statistical significance (p_valor< 0.0001) were: "cigarette use", "marijuana use", as shown in figure 2.

Figure 2. Dendrogram with the percentage of ECU in each class and words with greater chi-square (χ2) provided by the Iramuteq® software, Rio de Janeiro, Brazil, 2024.

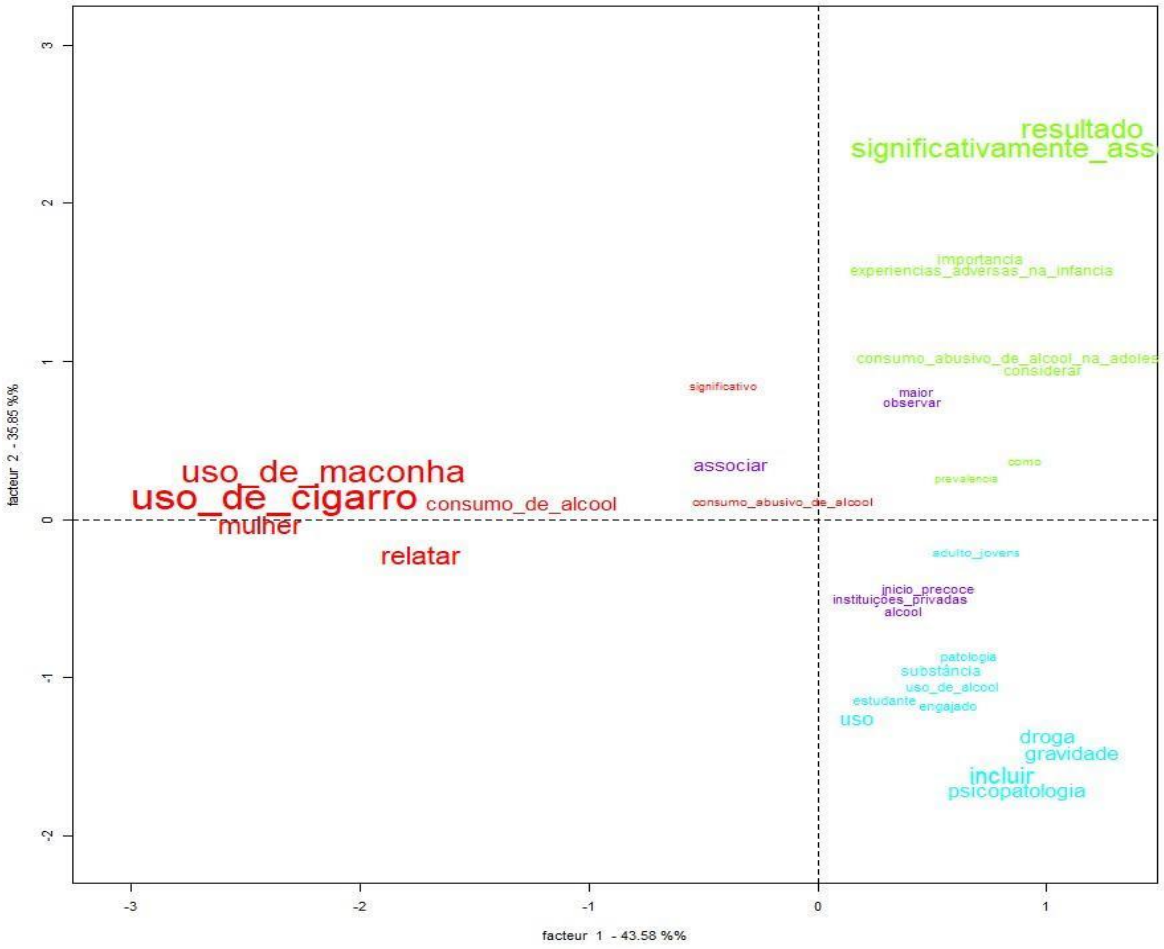


Source: authorship.

The lexical classes received the following nominations: group A) class 1 and 4: Biopsychosocial influences of substance use in different demographic/age groups and; group B) class 2 and 3: Impact of alcohol and psychoactive substance consumption on behavior and mental health: risk factors and long-term consequences.

In order to assist the categorization, the Correspondence Factor Analysis was performed, which made it possible to visualize the proximity of the words and classes from the DHC, presented in figure 3.

Figure 3. Correspondence factor analysis (CFA), Rio de Janeiro, Brazil, 2024.



Source: authorship.

There is greater central positioning of class 4 on the Cartesian axis. On the X axis, representing 43.58% of the distribution in the textual corpus, are class 3 and 4 (positive X axis) and class 1 is on the negative X axis. On the Y axis, representing 35.85% of the distribution in the textual corpus, are classes 1 and 2.

The combination of the two axes (X and Y), which offers a two-dimensional view, distinguishes the textual corpus into two lexical worlds. The first, lexical world, is mainly concentrated on the Cartesian axis, showing classes 1 and 4, which corresponds to the theme "Biopsychosocial factors and alcohol consumption: behaviors associated with gender and age group"; the second, containing the coordinates with positive X axis and negative Y axis, showing classes 2 and 3, corresponding to the theme "Impacts of alcohol consumption and behavioral factors: long-term consequences".

The lexical analyses, using Iramuteq®, allowed to discriminate the predominant argumentative tendencies on the research question "What are the biopsychosocial impacts on alcohol users reported in scientific articles?" from the texts listed in the research, as well as to analyze the interrelations between them. All lexical analyses were considered robust, as they complied with the

previously established methodological requirements and helped in the discussion of the present study, developed in the discussion of the present study.

DISCUSSION

GROUP 1: BIOPSYCHOSOCIAL FACTORS AND ALCOHOL CONSUMPTION: BEHAVIORS ASSOCIATED WITH GENDER AND AGE GROUP

The discussion of the findings of Group 1, which comprises Classes 1 and 4, reveal crucial aspects about the relationship between the consumption of alcohol (and other substances) and risky sexual behaviors, as well as psychological disorders, such as depression and anxiety. Analysis of these classes offers *significant insights* into different demographic groups, especially women and older adults.

The studies highlighted in Class 1 indicate that the female population is particularly vulnerable to the adverse effects of alcohol consumption, which include risky sexual behaviors and psychological disorders. The association between alcohol use and unprotected sexual practice increases the risk of sexually transmitted infections (STIs). This finding is presented in a cohort study conducted in Florida (USA) with women living with HIV showed that excessive alcohol and marijuana consumption was associated with an increase in risky sexual behavior (Deaterly et al., 2023).

In addition, studies show that frequent use of alcohol, tobacco, and cannabis in women is related to severe psychological disorders (GDP), including during pregnancy. Data from the National Survey on Drug Use and Health (NSDUH) 2015–2019 reveal that pregnant women with GPD had higher rates of substance use, highlighting the severe consequences of alcohol use during pregnancy (David et al., 2023).

The Covid-19 pandemic exacerbated these problems, with social isolation and increased alcohol use enhancing episodes of depression and anxiety. Research that took place in New York City (USA) indicates that 39% of respondents started or increased alcohol consumption during the pandemic, with a significant percentage reporting frequent use (Vu et al., 2023). This increase in consumption during periods of crisis suggests the need for specific interventions to mitigate the effects of substance abuse on women.

Class 4 discusses substance use among middle-aged and older adults, highlighting a worrying trend of increased use of alcohol, tobacco, and cannabis in this population. Study shows that individuals with depressive symptoms, especially those between the ages of 35 and 40, are more likely to consume alcohol in excess. This correlation is consistent across the ages studied, reflecting the need to address mental health in an integrated way with substance use treatment (Patrick et al., 2023).

Among adults over 50, factors such as tobacco use, mental health treatment, and belonging to non-Hispanic and Black-skinned groups are associated with higher alcohol and cannabis consumption (Kepner et al., 2023). In addition, people of Hispanic origin over 50 years of age and cardiovascular diseases demonstrate harmful habits in relation to alcohol, with a higher abusive consumption among those with a higher education degree (Yockey, 2021).

These findings suggest that the aging of the population brings new challenges related to alcohol consumption. The increase in consumption among the elderly, who may not have a history of alcohol use at other stages of life, highlights the need for specific preventive and educational actions for this age group.

The analysis of Classes 1 and 4 reveal the complexity of the relationship between alcohol consumption and its biopsychosocial impacts in different demographic groups. Women and older adults are particularly vulnerable, and the Covid-19 pandemic has exacerbated many of these problems. Public health interventions should be targeted to address the specific needs of these groups, promoting awareness of the risks associated with alcohol consumption, and offering support for mental and physical health. The integrated and personalized approach can help mitigate adverse effects and improve the quality of life of these individuals.

GROUP 2: EARLY ALCOHOL CONSUMPTION: EARLY APPROACH X LONG-TERM CONSEQUENCES

Group 2, which encompasses articles from classes 2 and 3, is interconnected by the theme of early alcohol consumption and the risk of future dependence. These studies show that early alcohol use is associated with a drop in school performance, learning difficulties, impairments in the development and structuring of cognitive-behavioral and emotional skills in young people.

Class 2 articles focus primarily on the use of alcohol and other psychoactive substances among college students and adolescents. The results reveal that alcohol is the most consumed substance, followed by marijuana and tobacco, highlighting the need for prevention programs and public policies to regulate the consumption of substances in the university environment. In addition, it is crucial to offer healthy sociability alternatives to students (Pires et al., 2020).

The relationship between excessive alcohol consumption and sensation-seeking, moderate/high risk of smoking, and low school scores is evident. Problematic alcohol consumption during adolescence can have significant effects on the neuroendocrine stress-response system, impacting subsequent stages of development. This suggests that substance use during critical periods of development may have long-lasting effects on the neuroendocrine system, increasing biological vulnerabilities and the risk of future addiction (Chomsri et al., 2019).

Professionals who deal with adolescents must be prepared to properly assess alcohol abuse or dependence in this age group. However, it is important to highlight that the diagnostic criteria for alcohol abuse and dependence, developed for adults, should be applied with caution to adolescents. Therefore, it is essential that professionals know the characteristics of adolescence and the particularities of chemical dependence at this stage.

Class 3 articles address different populations, from adolescents to older adults, identifying correlations between alcohol consumption, psychiatric disorders, suicidal ideation, and stress response. This class highlights the importance of specific interventions for different age groups.

The impact of adverse childhood experiences, such as sexual, physical and verbal abuse, neglect and domestic dysfunction, was examined, showing how traumatic events can increase the risk of psychiatric disorders and substance abuse in adolescence and youth. These adverse experiences are associated with a higher likelihood of high-intensity alcohol abuse and play a mediating role in psychiatric disorders (Jung et al., 2020).

Among the predictors of excessive alcohol consumption, greater symptoms of attention deficit hyperactivity disorder (ADHD), early substance use, alcohol use by parents, attendance at private institutions, and rurality stand out (Haardörfer et al., 2021). The impact on mental health is a common factor among Class 3 articles, with alcohol consumption being associated with psychiatric disorders, suicidal ideation, and stress response.

Suicidal ideation was more prevalent among adults over 25 years of age compared with young people aged 18 to 24 years. Using data from the national survey on drug use and health (2015-2019), it was identified that risk behaviors significantly increase the likelihood of suicidal ideation and attempts in older adults, highlighting the importance of specific interventions for this age group (Porter; Carrasquillo; Ashrafioun, 2024).

The findings reinforce that the impact on mental health is a common factor, in line with research that associates substance use with psychiatric disorders and stress. These studies offer a crucial basis for understanding the patterns and predictors of alcohol and drug use over time (Mannes et al., 2021; Porter; Carrasquillo; Ashrafioun, 2024).

Cognitive assessment of patients with a history of chronic alcohol abuse indicates that neurocognitive disorders are not uncommon. It is strongly recommended to perform an extended neuropsychological assessment after a minimum of 6 weeks of abstinence, as this period appears to be sufficient for cognitive functioning to recover to baseline (Bruijnen et al., 2021).

In light of this, such an analysis helps to identify subgroups with distinct patterns of consumption and psychopathology, providing *insights* into how different populations may need specific interventions. These findings underscore the need for personalized and integrated approaches

to prevent and treat substance abuse and its associated impacts, especially considering the specific vulnerabilities of each age group and demographic group.

CONCLUSION

Comprehensive analysis of alcohol consumption in diverse population groups and contexts reveals the complexity and multifaceted nature of its impact on biopsychosocial health. Although the prevalence of alcoholism is higher among men, the reviewed studies highlight a significant association between alcohol consumption in women and risk behaviors, as well as psychological disorders.

A particularly worrying finding is the abusive consumption of alcohol among children and adolescents, which is closely linked to culture and social context. This early consumption of alcohol is associated with several negative consequences, such as a drop in school performance, learning difficulties, and impairments in the development and structuring of young people's cognitive-behavioral and emotional skills. Substance use during critical periods of development can have long-lasting effects on the neuroendocrine system, increasing biological vulnerabilities and the risk of future dependence.

In light of these findings, it is essential to adopt integrated and multidisciplinary approaches to dealing with problematic alcohol consumption. It is crucial to understand the patterns and predictors that influence this behavior over time to develop effective interventions specific to different age groups and demographic groups. Professionals who deal with adolescents, for example, must be prepared to properly assess alcohol abuse or dependence.

Thus, prevention programs and public policies are essential to mitigate the damage caused by substance consumption. These programs should focus not only on reducing consumption, but also on promoting healthy alternatives for sociability and psychological support, especially for vulnerable populations such as adolescents and women. Specific interventions, such as those aimed at university students, may include creating social environments that do not encourage alcohol consumption and implementing policies that limit access to psychoactive substances (Pires et al., 2020).

Addressing alcohol consumption holistically, understanding the multiple factors that influence this behavior, is critical to developing more effective and comprehensive intervention strategies. This includes considering cultural, social, and psychological aspects that contribute to alcohol use. Promoting a healthier and more resilient society requires a concerted effort by educators, health professionals, policymakers, and the community at large.

In summary, this analysis highlights the urgent need for focused, evidence-based interventions to address alcohol consumption. Better understanding the risk factors and biopsychosocial impacts of alcohol makes it possible to develop more effective policies and

programs to prevent substance abuse and promote a healthier society. Education about the risks of alcohol, along with access to support and treatment services, can make a significant difference in reducing the harms associated with alcohol consumption and improving the overall health and well-being of the population.

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The psychological illness of police officers in the exercise of their profession

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Ana Patrícia de Oliveira Ribeiro Silva Pinheiro[1], Paula Maria Grave Musser[2] and Adriana Soely André de Souza Melo[3]

ABSTRACT

The emotional coercion exercised on police officers in society can lead to several consequences that are in the public interest. Dealing with the continuous coercion directed at the police officer, in view of the role assigned to him to prevent and combat violence in the social sphere, generates some complications from physical to psychological exhaustion. Seeking to understand the phenomena that occur, namely anxiety disorders, depression and often suicide, has been an arduous task and has shown some success since the 90s through studies observing groups of police officers. In the research, a subcategory of psychiatry is created, sicidiology, which was created to analyze these phenomena more deeply and thus elucidate other disorders that contribute to their worsening in relation to the group in question.

Keywords: Police officers, Work, Illness.

[1] Specialist in Legal Psychology – FACAPE
E-mail: patricia.majua@yahoo.com.br
[2] Specialist in Legal Psychology – FACAPE
E-mail: pgravepsi@gmail.com
[3] Doctor in Human Ecology and Socio-Environmental Management – UNEB
Email: soelyadriana@gmail.com

INTRODUCTION[4]

According to the World Health Organization (WHO), workers' health is an area of Collective Health that aims to develop comprehensive care for workers' health, in this sense it aims to promote and protect workers through actions to monitor environmental risks, working conditions, organization and provision of necessary assistance (WHO, 2001).

Studies indicate that being a police officer is among the six most stressful occupations, as well as the profession that has a rate eight times higher than that of civil servants, of acquiring heart disease, ulcers, effecting divorces, as well as pointing to the increase in alcohol consumption and anxiety disorders (COLETA, 2008).

These data may clarify the probable inability to deal with the difficulties of the occupation, which are of a physical and psychological nature. The work environment, the instruments used in the service and the perception that civilians have in relation to the work of police officers, contribute even more to the difficulties faced by them. Added to this is the action generally exercised by imputing and/or favoring violent behavior, consequently the responsibility that falls on the category when they need to answer for their actions, causing frustrations since it demands interfering in the subjectivity of each of the victims (COLETA, 2008).

However, it is perceived that the organization of work, the conditions that are offered to these workers, the exhaustion and insecurity generated by the type of activity, are fundamental factors to understand the impacts on the subjectivity of this subject (FERREIRA, 2017). "The nature of the military police profession is closely linked to the social regulation of other people's conduct, frequent contact in the face of violence, exposure of physical integrity and the risk of death, under an organizational regime that requires conditioned conduct" (FERREIRA, 2017, p. 1808-1809).

Originating from the Greek, police (polis), they have the same meaning as the word politics, thus referring to the constitution and organization of a certain collective authority (COSTA, 2004). This leads to the conclusion that all relationships that are related to power are political (REINER, 2004), therefore, police activity is political from the first findings to the present day (BAYLEY, 2001; MEDAUAR, 1995).

According to Medauar (1995), as time went by, the idea of police underwent modifications. In ancient times, there was an association of the idea of police with power with the focus on the political order referring to the state or city. In the Middle Ages, the influence of power in the administration was highlighted, still characterizing its political character, and in the Modern Age the notion of police began to have a new format in relation to public administration, thus reducing the characteristics of justice and finance.

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It is in the Contemporary Age that the models of police are presented according to those presented today, with their police institutions that are legitimized by the people (MEDAUAR, 1995). The police, then, as a model of institution, emerges in modern societies (REINER, 2004), thus understood as a corporation of people who have the same objectives, which are: to maintain order and perform social service functions, patrol public spaces and control crime (MEDAUAR, 1995; REINER, 2004); These activities, according to Bayley (2001), receive authorization from society, which in turn can be performed through physical or psychological force or threat, with the aim of regulating interpersonal relationships.

Police action legitimized by the people is not well understood since it is the use of force, that is, a society against itself, emphasizing aspects of coercion, control and oppression (BAYLEY, 2001). Considering these factors, even if they are considered necessary in a society, Reiner (2004) shows that the police may seem more successful the less they need it.

Nowadays, police reforms are already being considered, with the aim of reducing their oppressive and ostensive character, emphasizing the role of the community police, which understands that social measures must be considered when it comes to the safety of the population (ROSENBAUM, 2002).

Police officers are exposed to daily contact with the risk of death, their professional performance exposes them to conditions and environments that provide triggering risk factors such as mental and behavioral disorders, anxiety, such as stress, recurrent depression with the risk of leading to suicide (ASSIS; ROZA; BERNARDINO, 2020).

According to (BAYLEY, 2001), police institutions are present in several countries, and their activities are interpreted as actions that use physical force and truculence in situations that are often necessary with the objective of regulating the behavior of a certain group or even a single individual, based on a certain legal reference (BAYLEY, 2001; IVKOVIC, 2008; SILVA; BEATO, 2013).

Military police officers, in the exercise of their duties, assume different positions that are organized by hierarchies such as: major, captain, colonel, lieutenant colonel, sergeant, sub-lieutenant, corporal and soldier, and their attributions are different, according to the Brazilian Classification of occupation (BRASIL, 2020), taking into account that the function assigned to each of these ranks has an important role both in the corporation and in society. Thinking from the perspective of the attributions of each rank, corporals and soldiers are assigned operational tasks, such as the response and solution of occurrences and ostensible and preventive policing. Hierarchically, the warrant officers and sergeants supervise and direct the activities of the group of soldiers and corporals, and following the reasoning of the hierarchical activities, the lieutenant colonels, colonels and majors plan tactical actions, manage administrative activities, as well as ensure hierarchy and discipline.

The performance of work under pressure performed by these professionals generates a very

high stress potential with the risk of losing their lives, and presents with conditions identified regardless of the hierarchy that is peculiar to them (BRASIL, 2010). Cases of military police officers who leave for psychological treatment are very frequent (LIMA; BLANK; MENEGON, 2015). Police officers who use firearms and who carry out high-risk activities, including imminent death, are the ones who are most likely to face high-stress situations, according to Costa et al. (2017).

Military service is considered a work activity that includes risk, from the simplest to the most serious accidents (LOPES; LEITE, 2015). In this sense, it is clear that one cannot compare or define the level of stress that defines other professions. Entry into the police is by passing a public exam (THADEU; FERREIRA; FAIAD, 2012), among all the required requirements, such as written test, endurance test, candidates are also submitted to psychological evaluation that aims to assess the capacity for discernment, understanding and interpretation, among others, and to measure their aptitude for the use of firearms in the exercise of their functions (FEDERAL COUNCIL OF PSYCHOLOGY, 2010).

The process of psychological assessment is recognized by the Federal Council of Psychology (CFP) as an extremely important tool for its technical-scientific character, since it collects data from the individual, provides material for interpretation regarding psychological phenomena through techniques and methods carried out by the professional psychologist duly qualified for this, and the results of these come from the relationship of the individual with society (FEDERAL COUNCIL OF PSYCHOLOGY, 2018).

Entry into the police career is marked by many requirements in its selection process, including psychological evaluation, however, research indicates that there is no periodicity with regard to continuous evaluations within the service (BRITO; GOULART, 2005; COSTA, 2004).

Brito and Goulart (2005) mention that the psychological assessment has the function of a predictor of some unwanted behaviors among police officers, in the case of those that are contraindicated based on the result of the assessment, intolerant behaviors and deviation of conduct are perceived. The main deviations of conduct are torture, arbitrary violence, corruption and drunkenness, embezzlement, aggravated robbery, assaults, homicides, etc., in addition to the deviations mentioned, studies indicate that military police officers who committed suicide had been contraindicated or indicated with restriction in the psychological examination (BRITO; GOULART, 2005).

THEORETICAL FRAMEWORK

These professionals bring with them the feeling of oppression due to the most diverse problems of a social order, where it points to a mistaken culture that they are conflict solvers, on the other hand they are also seen as violent people, in this sense there is a coercion so that they do not

make mistakes in the exercise of their function, whatever it may be. Of the many attributions related to security, it needs to deal with expertise to minimize violence through dialogue and, when this is not possible, to act effectively so that neither the police nor the civilian suffer physical and emotional damage, but this is not always possible, leaving them exposed to such situations on a daily basis.

Police officers are subjected to live under a disciplinary regime with strict rules that are specific to the Corporation, they are forced to adopt a type of behavior, thus causing a limitation in relation to the expression of their subjectivity.

The disease process is triggered by several factors, which are biological, social or psychological, and can affect any individual regardless of gender, age or ethnicity, causing temporary or permanent consequences in relation to productivity and quality of life.

In this way, the work of the police officer exposes him to triggering factors of behavioral and social disorders, thus causing the emergence of various pathologies such as depression, stress, anxiety, and can lead to suicide (ASSIS; ROZA; BERNARDINO, 2020).

The symptoms of these diseases are characterized by tiredness, loss of interest, low self-esteem, lack of concentration, sad mood, discouragement, burnout syndrome, etc. Another problem found is work under stress and in extended shifts, which predispose these police officers to poor sleep quality, and this in turn causes damage to health and increases the risk of death. It contributes to signs and symptoms, among them: circadian dysregulation, sleep insufficiency, in addition to causing disruption of family and social life, which can lead to an increase in allostatic load, altered homeostasis, immune deficiency and endocrine dysfunction.

OSAS (Obstructive Sleep Apnea Syndrome) presents clinically in individuals who present symptoms of snoring, breathing pauses during sleep, and daytime sleepiness or a feeling of non-restorative sleep. This event usually causes reduced oxygenation of the body and sleep fragmentation, leading to systemic consequences and decreased sleep quality. The identification and treatment of these disorders in relation to sleep are extremely important and useful in the policy of prevention of occupational accidents among military police officers so that these problems arising from the lack of quality and time of sleep are solved.

The World Drug Report points out that one in every 100 adult deaths is attributed to the use of illicit drugs, one of the predisposing factors may be sensitivity to anxiety, for example, in the relationship between substance use and emotional disorders. Some scholars consider the use of drugs, licit or illicit, as a result of problems of self-esteem, self-confidence, lack of ability to deal with adverse situations and psychic suffering, thus leading these people to seek temporary relief from the use of these substances, thus relating the factors triggered and possible significant consumption rate by these agents (SOUZA et al, 2013).

According to Bastos (2010), it was from the 1950s onwards, through a subspecialty of psychiatry called suicidology, that the phenomenon of suicide began to be considered a public health problem. Suicide is the death resulting, directly or indirectly, from acts performed by the victim himself aware of the production of such a result. Suicidiology seeks to produce knowledge about this phenomenon, including biochemical, pharmacological, psychiatric, sociological, and psychological explanations.

Correlated to this, symptoms of post-traumatic stress increased significantly in addition to the associations between lack of organizational support and hopelessness, an important risk factor for suicide in police officers, who in turn suffer as previously said from coercion at work, which they can develop problems such as anxiety and depression becoming an easy target for this sad practice (PEREIRA; EARLY MORNING; KAWAHALA, 2020).

METHOD

This article is a documentary research in a qualitative approach, based on documents, legislation and studies related to the subject. The methodology applied was through qualitative bibliographic research, with scientific articles, books, periodicals being consulted in order to address the theme with greater intensity and clarity. (MARCONI; LAKATOS, 2011). The article aims to demystify the function performed by the police officer and understand the stressors that may interfere with their psycho-emotional health. Thus, for a better understanding of the theme, different studies were carried out that supported the article. To build the theoretical framework, we chose the following scholars from Dejous (1992), Lipp (1996), Santos, Hauer and Furtado (2019) among others who will contribute to the theoretical basis and deepening of the theme in question.

DISCUSSION

According to Dejours (1992) and Lipp (1996), human suffering can be associated with the work process and, therefore, it is necessary to understand its causes in order to modify it and reorganize contingencies that are more favorable to the work process. Stress, in this context, results from the interaction of the individual's characteristics and the influences suffered by him through the environmental context. That is, it is the relationship between internal and external environments, together with the individual's perception of his own capacity to respond and cope (DEJOURS, 1992; LIPP, 1996, apud OLIVEIRA; SANTOS, 2010).

Several factors related to working conditions must be considered in order to identify the causes of psychological suffering with regard to the professional performance of police officers, problems such as dissatisfaction with working conditions, stress, overload, long working hours,

unconditional obligation not to be fragile, among other factors can trigger the development of psychological disorders. (SANTOS; HAUER; FURTADO, 2019).

It is possible, therefore, to think about effective interventions within the corporation for stress management, such as a program that aims to diagnose and measure the level of stress; recognition of internal and external stressors that are present in their daily lives; food program accompanied by a nutritionist/nutritionist and recreational activities at a certain time of the day, that is, it is important that there is a set of interventions that cover the social, affective and physical health of professionals (COSTA *et al*., 2007; LIMONGI FRANÇA, 2002).

In summary, the study presented here sought to bring to light some aspects of fundamental importance in the social environment, since the vulnerability of military police officers in relation to stress is perceived through social media. This study is relevant in view of the emotional crisis to which the vast majority of military police officers are subjected.

Thus, there is a need for more in-depth and complementary studies to the one presented here, which are capable of qualitatively and quantitatively evaluating the data obtained under observation, since stress in the profession of military police is very common and should not go unnoticed.

CONCLUSION

The present research made it possible to verify that the work environment in which the Police Officer is inserted can be a trigger for diseases, such as stress, depression, anxiety, among others. Due to the rigidity of the principles of one's own work, discipline and military hierarchy, low salaries, exacerbated workload, psychological tension regarding the protection and guarantee of life, always being exposed to life-threatening situations.

The lack of assistance, and sensitivity of the Military Corporation itself, not having adequate psychological health service to assist the police officers on active duty, mainly. The low salary encourages many of these police officers to seek other services to increase family income, consequently reducing their rest hours. Poor sleep quality considerably aggravates the risks of both errors in practical action and logical reasoning, often leading the police officer to use illicit substances.

The risk of suicide is also a point to be considered within this context. All these factors provide the police with a great conflict, in protecting and having to seek their own protection, where they are to take care of, serve the population, but they do not receive specific care from their own institutions, thus causing fears and uncertainties.

In order for the situation in relation to stress to improve, it is important first of all to admit the problem, because many police officers are affected, but neither seek nor accept help because they do

not recognize that their work causes damage, in this sense it is necessary that there is involvement on their part.

Psychology can offer several preventive and prophylactic works in relation to the treatment of the emotional health of police officers, some such as: individual monitoring, behavioral training, individual or group psychological guidance. Some very useful suggestions are the practice of activities that are not related to function that promote well-being and relaxation, such as some sports that do not generate competition, but socialization, meditation, yoga, stretching, pilates, etc. Stimulate the search for reliable friendships that are not from the preferred work environment. It is important to note that stress is most of the time not identified immediately, for this, it is necessary that police officers and those who are part of their life are aware of the first signs, remembering that each case is unique with its characteristics and specific method of dealing.

In this sense, it is concluded that stress in police officers is a very complex demand, but that from an awareness and acceptance of the problem by the affected person, it is possible to treat it, minimizing the emotional consequences. It is necessary that the Corporation offers this service responsibly, and sustains this place in front of its subordinates, without imputing to them any value judgment or debique so that such professionals can have their quality of life and well-being assured in their work environment and outside it.

The study made important contributions to the field of mental health. Usually, research with military police officers focuses only on specific aspects of the profession, in this sense, mental illness and aggressiveness are not analyzed in a more detailed way, a factor that would be of paramount importance for understanding the phenomenon more broadly.

It is important to consider that the actions mentioned here can be useful as strategies for health promotion and prevention of mental illnesses in the category. Provide public security agencies with spaces to think about short, medium and long-term projects to improve the work context of police officers.

Therefore, it is suggested that from this work, the competent bodies can identify and intervene more effectively in the quality of life of military police officers, so that they can offer them decent working conditions, continuous psychological follow-up thinking about the promotion of mental health.

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Origami: A path to successful teaching and learning of geometric concepts in basic education

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Narciso Galástica Ruiz[1], Alcibiades Medina[2] and Yacsury Yamileth Montilla Arroyo[3]

ABSTRACT

The teaching of geometry requires encouraging the student to develop concentration processes. Attention, patience, creativity, among others, so that they learn to think and understand abstract concepts that can have meaning and usefulness within the educational process and daily life, analyzing the origami technique for the successful teaching and learning of geometric concepts.

Keywords: Basic education, Didactics, Geometry, Origami, Origami and origami, Abstract concepts.

[1] Master in Educational Mathematics Institution: University of Panama
Regional University Center of Los Santos, CRULS Regular Professor of the University of Panama
E-mail: ngalastica06@gmail.com
[2] Master's Degree in Educational Mathematics Institution: University of Panama
Regional University Center of Los Santos, CRULS Temporary Teacher of the University of Panama
E-mail: alcimed18@gmail.com
[3] Bachelor of Mathematics Institution: University of Panama
Los Santos Regional University Center, CRULS CIP: 6-721-1622
E-mail: yacsury9830@gmail.com

INTRODUCTION

This article is based on a documentary review of the origami technique in such a way that it facilitates the teaching-learning process of mathematics, especially geometry. This technique allows the didactic strengthening of teachers for the development of geometric contents, resulting in a pedagogical strategy that is beneficial in the teaching and learning process of students. The importance of the study is based on the intention of introducing techniques with a new vision to the didactics of geometry teaching, conceived as classroom action, thus contributing to reduce failure rates in the area.

BACKGROUND

Origami is the Spanish term for paper folding or paper folding, it is a synonym of Origami referring to the Japanese art of paper folding, which has become a technique incorporated in education in various areas, which facilitates the teaching and learning process in students.

Its history begins in China in the first or second century like paper, and reaches Japan in the sixth; It was used as an exclusive pastime for the upper classes, considering that only they could have access to paper due to its high cost, since it was considered a luxury item. By 1338, the Muromachi Period, paper was more accessible, so origami ornaments emerged to highlight social class.

However, in the year 1603, the Tokugawa Period, the democratization of origami took place, giving way to the emergence of a great culture; giving basis to the bird and the crane, which is the most popular figure in Japan.

At the beginning of the 20th century, the promoter of origami was Miguel de Unamuno y Jugo, who discovered it in an exhibition while visiting Paris for the inauguration of the Eiffel Tower, later creating his school of folders. (Prieto Bustamante, 2017). This has been the most important contribution to origami since the invention of paper, since it has allowed the international dissemination of the different creations.

Thus paper folding appears more frequently in the East, specifically,

> in Japan, a technique that is transmitted through generations within the Shinto religion; one of the oldest expressions developed in the seventeenth century were the symbols of fortune called Noshis and the poetics of Haiku, used in the teachings of Zen Buddhism and the Jöruri puppet theater made with paper folds (Fernández Arevalo, 2017).

Another aspect of interest, it is observed that the ceremonial and symbolic character of paper folding was lost over time and, reborn in 1878 in the Froebelian works, it is thus, that the activity of folding paper resurfaces with pedagogy and didactics, being Friedrich Fröebel who incorporates manual work into the educational system (Santillana Mujica, 2018). In this sense, the author highlights that:

> Folding paper, starting from a square, had the objective of the intuitive teaching of geometry, using its shapes to bring knowledge closer and generate a question and answer activity between the teacher and the student, thus developing the student's sense of observation and criticality (p.12).

Another important contribution to this is made by the pioneer of modern origami, the Japanese Akira Yoshizawa, to whom we owe the current symbology of the folding instructions of the models, which allowed the international dissemination of the different creations, regardless of the language in which these developments are written.

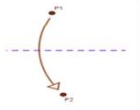
For Royo Prieto (2002) "origami creations, according to the laws of nature, require the use of geometry, science and physics. They also cover religion, philosophy, among others; the possibility of job creation is infinite" (p.45). Certainly, the author affirms, folding is a dialogue between the artist and the paper, a manual work, of spirit and creation, which must be carried out with a state of positive energy that radiates from the creativity and innovation of the being.

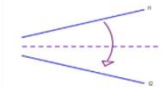
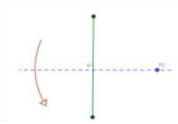
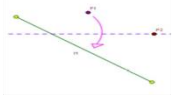
In the face of these useful approaches to origami, two currents have been established today, the non-scientific school, where philosophy consists of expressing the essence of what is to be represented with the minimum of folds, and the scientific school, where folding has been developed fundamentally by mathematicians, engineers and technicians. pursuing accuracy with a number of mathematical and algorithmic methods.

We have taken into account Humiaki Huzita's proposal as a reference to the six axioms and Koshiro Hatori's the seventh axiom of paper folding, as cited by Santa Jaramillo (2017).

Table 1 presents the axiomatic postulates that provide the theoretical basis for the use of the origami of paper folding as a didactic tool for the teaching of geometric content in basic education, allowing a dynamic learning of geometry, where concepts appear and reappear integrating manipulation, theory and art. as well as, facilitating the consolidation and stimulation of the highest levels of abstraction.

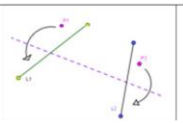
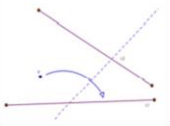
Cuadro 1
Definiciones de Axiomas de la papiroflexia

Axioma	Gráfico	Objeto matemático
Dados dos puntos P1 y P2, se puede realizar un pliegue que los conecte		Recta que pasa por dos puntos
Dados dos puntos P1 y P2, se puede realizar un pliegue que los conecte P1 sobre P2		Mediatriz del segmento P1 y P2

Dadas dos rectas l1 y l2, se puede plegar l1 sobre l2		Bisectriz del ángulo formado por las rectas l1 y l2
Dado un punto P y una recta l, se puede hacer un pliegue perpendicular a l que pase por P.		Recta perpendicular a otra que pasa por p. Segmento de longitud mínima que une un punto de l y p. Distancia de p a l
Dados dos puntos P1 y P2, y una recta l, podemos hacer un pliegue que haga corresponder a P1 con un punto de l y que pase por P2		Repitiéndolo, se obtiene la envolvente de una parábola. Es equivalente a encontrar la Intersección de una línea con un círculo, por lo que puede tener 0, 1 o 2 soluciones

Fuente. *Santa Jaramillo (2017)*

Cuadro 1
Definiciones de Axiomas de la papiroflexia (Cont...)

Axioma	Gráfico	Objeto matemático
Dados dos puntos P1 y P2, y dos rectas l1 y l2, se puede hacer un pliegue que haga corresponder a P1 con un punto de l1 y P2 con un punto de l2.		Permite resolver ecuaciones cúbicas (ecuaciones de tercer grado).
Dado un punto P y dos líneas l1 y l2, hay un pliegue que coloca p en l1 y perpendicular a l2.		Solución de una ecuación de segundo grado, por lo que puede tener dos soluciones reales distintas, dos soluciones reales iguales o no tener solución en los reales

Fuente. *Santa Jaramillo (2017)*

- Two different dots on the same sheet of paper.
- A point on a fold.
- In summary, the axioms take as their theoretical basis:
- Two folds of the same sheet.
- Two angles and their congruence if they overlap when they overlap.
- Two segments and their congruence if they overlap when they overlap.

Based on this, origami, in addition to creating its own rules, also provides education with an important tool to improve the capacities of concentration, memory, analysis and development of geometric concepts through the activation of logical-spatial thinking and the development of psychomotor skills.

Origami as a technique for teaching geometry is governed by rules, even if:

1. Vergara Soler (2017) explains that the choice of paper is the first rule to be followed. It must be perfectly cut out into a square and the size will depend on the dimensions that you want the figure to have. If the measurements are not adequate, the piece may go wrong and you may have to repeat steps that can leave noticeable marks on the paper.
2. The second rule mentioned by Vergara Soler (2017) is that you must work carefully and neatly, so it is necessary to work on smooth and stable surfaces. It is worth mentioning

washing your hands before forming a figure, cleaning the furniture to be used and making sure that it does not have unevenness in order to have exact folds.

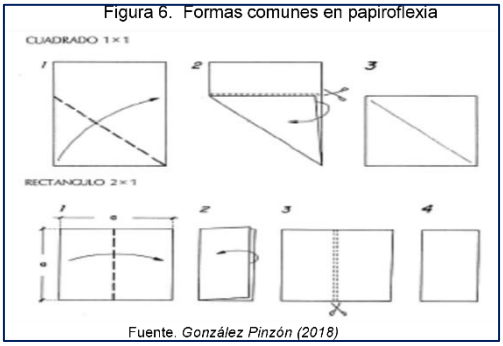
3. The third rule is that it is necessary to go over the folds and folds with the thumbnail, these will be better marked and thus the following steps are easier (González Pinzón, 2018).
4. At the same time, González Pinzón (2018) explains as a fourth rule that you must know the set of international symbols to make a move, because each step shown has an order that must be followed.
5. As a fifth rule, Vergara Soler (2017), explains that those who have never practiced the origami technique should start doing it with the base figures.

The size and shape of a paper to be used depends on the shape and size that is sought in the final result. As Corrado Núñez (2018) explains, "the paper for most origami must be square, but some models are made from rectangles (...). Others use paper in the shape of a triangle, rhombus; five-, six-, or eight-sided paper, and

> even round" (p.18). In any case, its measurement must be proportional, both in height and width.

Thus, González Pinzón (2018) indicates that "the three most common forms in origami are: the 1 x 1 square, the 2 x 1 rectangle, and the folio, which does not require an exact measurement" (p.19). Sometimes, the paper you have does not have the desired measurements, which is why the same author points out that "often, the first step is to fold the paper in order to cut it into the desired shape without the need to make measurements" (p.20).

Figura 6. Formas comunes en papiroflexia



Fuente. *González Pinzón (2018)*

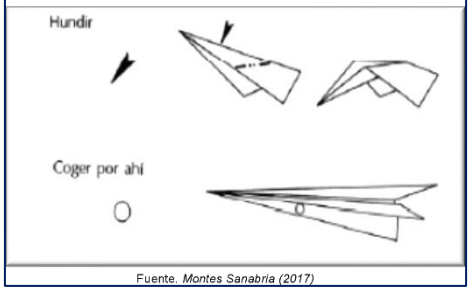
In this sense, to obtain an adequate size, it is necessary to fold the paper and thus cut it. For his part, González Pinzón (2018, p.29) mentions relevant aspects of the role that:

- The size of the paper is not important, unless it is so small or large that it cannot be handled. In most folds, a piece between fifteen and thirty centimeters wide can be used.

- The paper used in origami must be resistant, thin and of the right color. But if you can't get a special paper, the truth is that you can use just about any other.
- The type of paper is not a limitation for anyone who wants to create origami figures. It doesn't matter if it is a gift, office, transparent or a more specialized one, it only needs to be resistant to make several folds and have a passion for folding.

In short, regarding the paper, any type can be used, since each one will give character and its own personality to the piece. What should be taken into account is that some are more opaque and others that transmit light better. Similarly, consider the thickness, since for greater folds it is advisable to use a lower thickness than for less complex pieces.

Figura 9. Tipos de flechas o signos



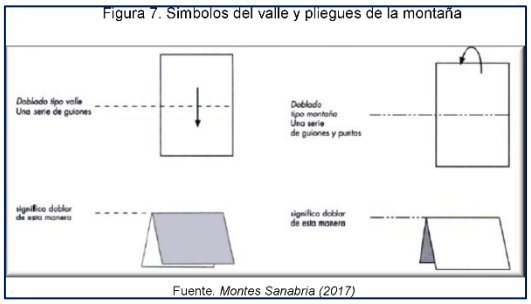
Fuente. *Montes Sanabria (2017)*

In origami, a common language has been created developed by Akira Yoshizawa, who in the sixties created a set of symbols that are currently used internationally. For his part, Montes Sanabria (2017) indicates that:

> The symbols necessary to learn are those of the valley and the folds of the mountain. The former are folded inwards and are indicated by dashes (---), the latter outwards and are indicated by a series of dashes and dots (-···-···-). It is important to take into account the directions to achieve them.

Figure 7 shows symbols of the valley and folds of the mountain.

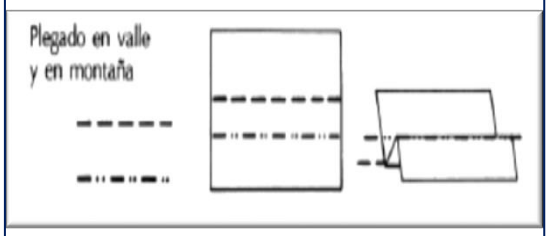
Figura 7. Símbolos del valle y pliegues de la montaña



Fuente. *Montes Sanabria (2017)*

When creating a figure, it is likely to be composed of these types of folds, so it is important to recognize when it is inward or outward, since figures can have both movements.

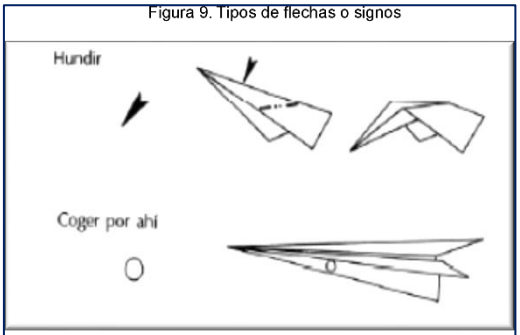
Figura 8. Plegado hacia adentro y afuera



Fuente. *Montes Sanabria (2017)*

Other types of arrows or signs according to Montes Sanabria (2017) "(...) indicates that it must sink, press, or squeeze at certain points."

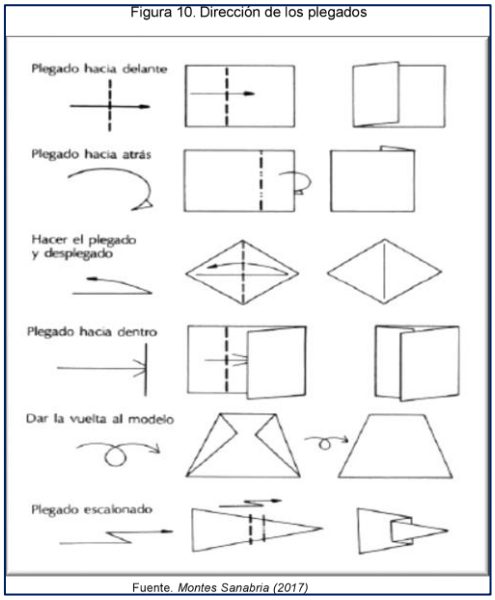
Figura 9. Tipos de flechas o signos



Fuente. *Montes Sanabria (2017)*

Montes Sanabria (2017) indicates that "the arrows show the direction in which we must turn: left, right, up, down, forward, backward and inside".

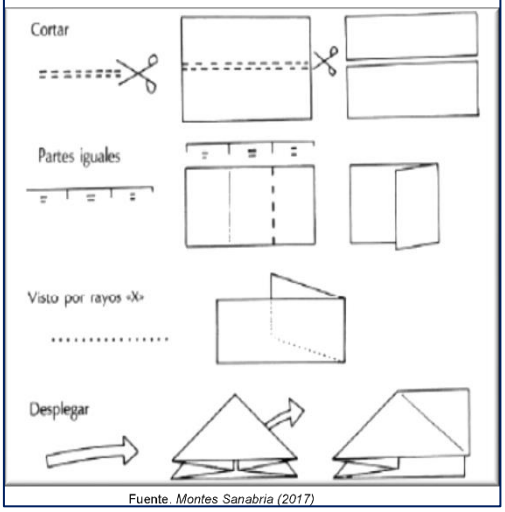
Figura 10. Dirección de los plegados



Fuente. *Montes Sanabria (2017)*

In addition to the direction or direction of the fold, there are also complicated processes that can only be performed if you know the origami symbols well. These can range from cutting, unfolding, folding to fold again, repeating a step, to seeing the result of the figure on both sides.

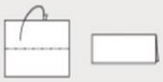
Figura 11. Otros procesos



Fuente. *Montes Sanabria (2017)*

It is understood that to make the figures you must always follow the instructions correctly and look at the drawings on the diagrams. This allows for an easier, more accurate and quality process.

Figura 12. Síntesis de Pliegues y líneas básicas

Tipo de línea.	*Proceso de plegado.*	*Explicación.*
Pliegue valle. ----------		Consiste en doblar hacia delante, llevando un lado del papel sobre el otro.
Pliegue Monte. ----------		Consiste en doblar hacia atrás, llevando un lado del papel sobre el otro.
Plegar y desplegar. ó		Esto en realidad no es un pliegue, son dos que se hacen uno tras otro. Consiste en doblar, bien sea en monte o en valle y acontinuación desdoblar. El resultado que queda es una marca.
Marca. ————		Las marcas son siempre el resultado de plegar y desplegar algo.
Rayos X. ----------		Este tipo de línea, puede representar pliegues que se están haciendo en alguna capa de nuestro modelo que no podemos ver o bien marcarnos alguna línea del borde de la figura que está oculta.

Fuente. *Montes Sanabria (2017)*

The different types of origami are classified as follows:

Cuadro 2
Clasificación según finalidad, tipo de papel y cantidad de piezas utilizadas

Aspectos	Tipos y clasificación
Finalidad	Artístico: construcción de figuras de la naturaleza Educativo: construcción de figuras para el estudio de propiedades geométricas y desarrollar diferentes habilidades
Forma del papel	Tiras: se parte de una tira de papel Papel completo: se parte de un trozo de papel en forma cuadrangular, rectangular o triangular
Cantidad de trozos	Tradicional: un solo trozo de papel inicial Modular: varios trozos de papel inicial simples que se pliegan o superponen para formar unidades, generalmente iguales, que se unen para dar lugar a una figura compleja

Fuente. *Grados Pinto (2019)*

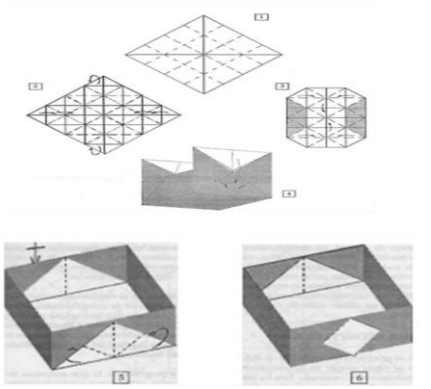
Cuadro 3
Clasificación según tipos

Tipos	Características
Papiroflexia de acción	Estáticas: figuras inmóviles Móviles: figuras con las que se puede emular movimientos de objetos/animales.
Papiroflexia modular	Se crean figuras más complejas colocando varias piezas iguales juntas.
Papiroflexia con plegado húmedo	Se humedece el papel de figuras ya creadas para moldearlo a la forma deseada. Con esto se consigue mayor realismo a las figuras
Papiroflexia pura	Únicamente se realiza mediante pliegues
Papiroflexia teselada	Composición de figuras que se repiten para cubrir totalmente una superficie.

Fuente. *Vásquez Fuerte (2018)*

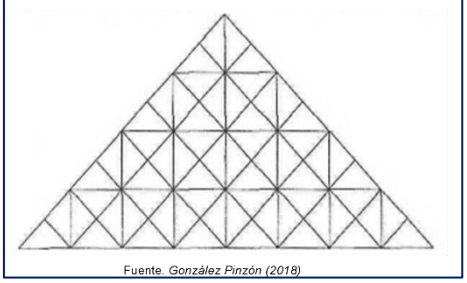
The origami technique is part of a whole arsenal of functional and economic educational aids that a teacher can incorporate into the work within a classroom at any of the school levels, it only has one limitation: the imagination or creativity of those who use it. Demonstrations and applications developed through the origami technique are presented, illustrated by González Pinzón (2018):

Figura 13. Básico. Caja rectangular básica



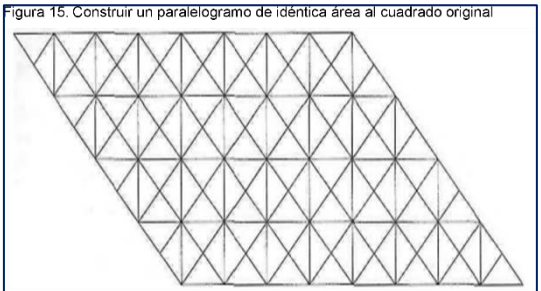
Fuente. *González Pinzón (2018)*

Figura 14. Triangulo isosceles igualmente rectangulo isosceles con la misma área cuadrarda



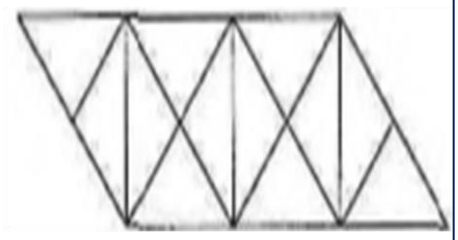
Fuente. *González Pinzón (2018)*

Figura 15. Construir un paralelogramo de idéntica área al cuadrado original



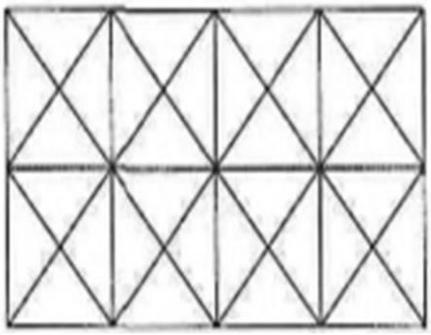
Fuente. *González Pinzón (2018)*

Figura 16. Paralelogramo con dobleces de la figura anterior



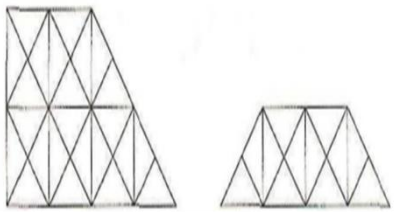
Fuente. *González Pinzón (2018)*

Figura 17. Boceteo de un rectángulo



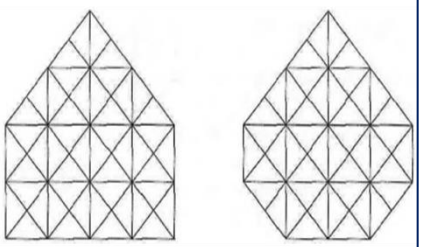
Fuente. *González Pinzón (2018)*

Figura 18. Trapecio rectángulo e isósceles



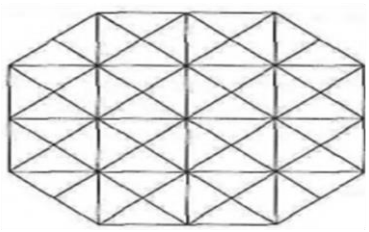
Fuente. *González Pinzón (2018)*

Figura 19. Pentágono y heptágono



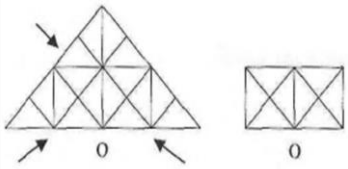
Fuente. *González Pinzón (2018)*

Figura 20. Octógono con sus lados iguales cuatro a cuatro



Fuente. *González Pinzón (2018)*

Figura 21. Suma ángulos interiores de un triangulo



Fuente. *González Pinzón (2018)*

It is shown that the sum of the interior angles of any triangle is 180° To do this, the square is divided into two triangles again. If you bring the three vertices to the common point 0, the three angles are in a straight line forming a flat angle or 180°.

As a synthesis, it is considered that the technique of origami or origami, is understood as the art of making paper figures, it is an ancient activity that endures today as an educational instrument. Its qualities are positive, as it favors concentration and attention.

As a technique used for the teaching of geometry, from a didactic point of view, the folding process involves and motivates the student, and favors the development of skills such as precision and spatial vision, being able to have an objective perspective to manipulate it and study the geometric properties in situ.

The technique contains seven defined axioms, each of which is associated with the resolution of mathematical objects that are configured in the teaching of geometry. By labeling an origami structure with length, width, and height, students will learn key terms and ways to describe a shape, and can use it to determine the area by applying a formula to a real-world structure.

Therefore, in some ways, it is an innovative resource to complement instruction in geometric construction, determine geometric and algebraic formulas and increase manual dexterity. In addition, it is a great way to be able to merge different areas such as science, technology, engineering, art, and mathematics.

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Educational technologies developed for the care of children with gastrostomy: An integrative review

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Lenine Almeida Firmino Borges[1], Maria Solange Nogueira dos Santos[2], Vanusa Maria Gomes Napoleão dos Santos[3], Edna Maria Camelo Chaves[4] and Lidiane do Nascimento Rodrigues[5]

ABSTRACT

Introduction: The educational technologies developed for the care of children with gastrostomy can help guide current educational and care practices. Objective: To identify the available evidence on the educational technologies developed for the care of children with gastrostomy. Method: This is an integrative review that considered the search in the following databases: Latin American and Caribbean Literature on Health Sciences, Online System for Search and Analysis of Medical Literature, Nursing Database and Google Scholar. Results: The technologies found were of the light-hard type, including booklets, standard operating procedures, educational manuals and videos. Conclusion: The available technologies are used by nursing, playing a fundamental role in the health education of caregivers of children with gastrostomy, especially in relation to complications and handling of the tube for feeding, cleaning and bathing.

Keywords: Gastrostomy, Child, Educational Technology, Validation Study.

[1] Unichristus University Center
[2] Hospital Leonardo da Vinci
[3] State University of Ceará
[4] State University of Ceará
[5] State University of Ceará

INTRODUCTION

A gastrostomy is a type of ostomy that consists of an artificial opening of the upper digestive tract, establishing communication between the stomach and the external environment through an access tube that connects the stomach to the abdominal wall, ensuring a safe route for nutrition, hydration and administration of medications in patients whose oral route is unable or at risk of feeding (SILVA et al., 2019).

The pediatric population has shown a growing demand for the use of gastrostomy tubes (RIBEIRO et al., 2022). However, in Brazil, there is still a lack of literature on the prevalence of Enteral Nutritional Therapy, as well as on the number of children with gastrostomies. The few existing studies focus on the characterization of the sociodemographic and clinical profile, conducted at the local or regional level (SILVA et al., 2019).

Most children who use the gastrostomy tube are premature, have abnormalities in the upper digestive tract, malformations of the central nervous system and neuropsychomotor delay, with a predisposition to dysphagia in the oropharyngeal phase. This indication can be temporary or permanent, depending on the needs of each child (CUNHA; BRITO; PANTOJA, 2021).

The care of children with gastrostomy should follow a plan that ensures adequate nutritional intake, prevents infections, avoids skin lesions around the gastrostomy, and can prevent and identify problems and complications early (RODRIGUES, 2017).

Research in Brazil identified that nurses were the ones who most performed the first gastrostomy tube change in children (SILVA et al., 2019). However, there is still fear, doubt, and insecurity among these professionals during the procedure. Some face difficulties in handling these and other devices, making it necessary to use new technologies, protocols, and in-service training (FAVARO et al., 2020).

Technologies are products or processes that allow the involvement of professionals in the provision of care to the user and in the development of the health education process, contributing to the provision of relevant information to the target audience (NIETSCHE, 2014).

Thus, the educational technologies developed for the care of children with gastrostomy can help to guide current educational and care practices. As the leader of the nursing team, the nurse has a fundamental role in directing the care to be provided to these patients, which should always be based on the best available evidence on the subject. Therefore, it is essential to identify the available evidence on the educational technologies developed for the care of children with gastrostomy.

METHOD

This is an integrative literature review (MENDES; SCOTT; GALVÃO, 2008). Among the review methods, the integrative review is the broadest, allowing the simultaneous inclusion of

experimental and quasi-experimental research, providing a more complete understanding of the topic of interest. The elaboration of the integrative review consists of the following steps:

1. Definition of the guiding question to be answered;
2. Conducting the search to identify and collect as many relevant primary surveys as possible within the previously established inclusion and exclusion criteria;
3. Critical analysis of the criteria and methods used in the various studies selected to determine whether they are methodologically valid;
4. Systematic evaluation of the selected studies;
5. Interpretation and synthesis of data;
6. Conclusions and presentation of the integrative review.

To prepare the guiding question, the IOP strategy adapted from the acronym PICO was adopted, as follows: P (Population): children with gastrostomies; I (Intervention): development of educational technologies; O (Expected outcomes): evidence for the care of children with gastrostomy (FINEOUT-OVERHOLT; STILLWELL, 2019).

Thus, the following research question was formulated: What evidence is available in the literature on educational technologies developed for the care of children with gastrostomy?

The following inclusion criteria were considered: scientific documents in English, Portuguese and Spanish, without time frame, that addressed the topic of interest and that answered the guiding question. Duplicate studies were excluded.

The data collection of this review was carried out in October 2022, through searches in the Nursing Database (BDENF), Latin American and Caribbean Literature on Health Sciences (LILACS) and Online System for the Search and Analysis of Medical Literature (MEDLINE), with access through the Virtual Health Library, IBECS (via VHL) and Google Scholar.

Controlled descriptors were selected to set up strategies for searching the articles, which were extracted from the Health Sciences Descriptors (DeCS). Thus, in the LILACS, BDENF, IBECS and MEDLINE databases, the following crossings were used: Gastrostomy AND educational technologies, gastrostomy AND validation, gastrostomy AND educational technologies, gastrostomy AND children.

It should be noted that all the scientific works used were duly cited in accordance with Law No. 9,610/98, which conceptualizes the relevant aspects in relation to the scope of copyright (BRASIL, 2016).

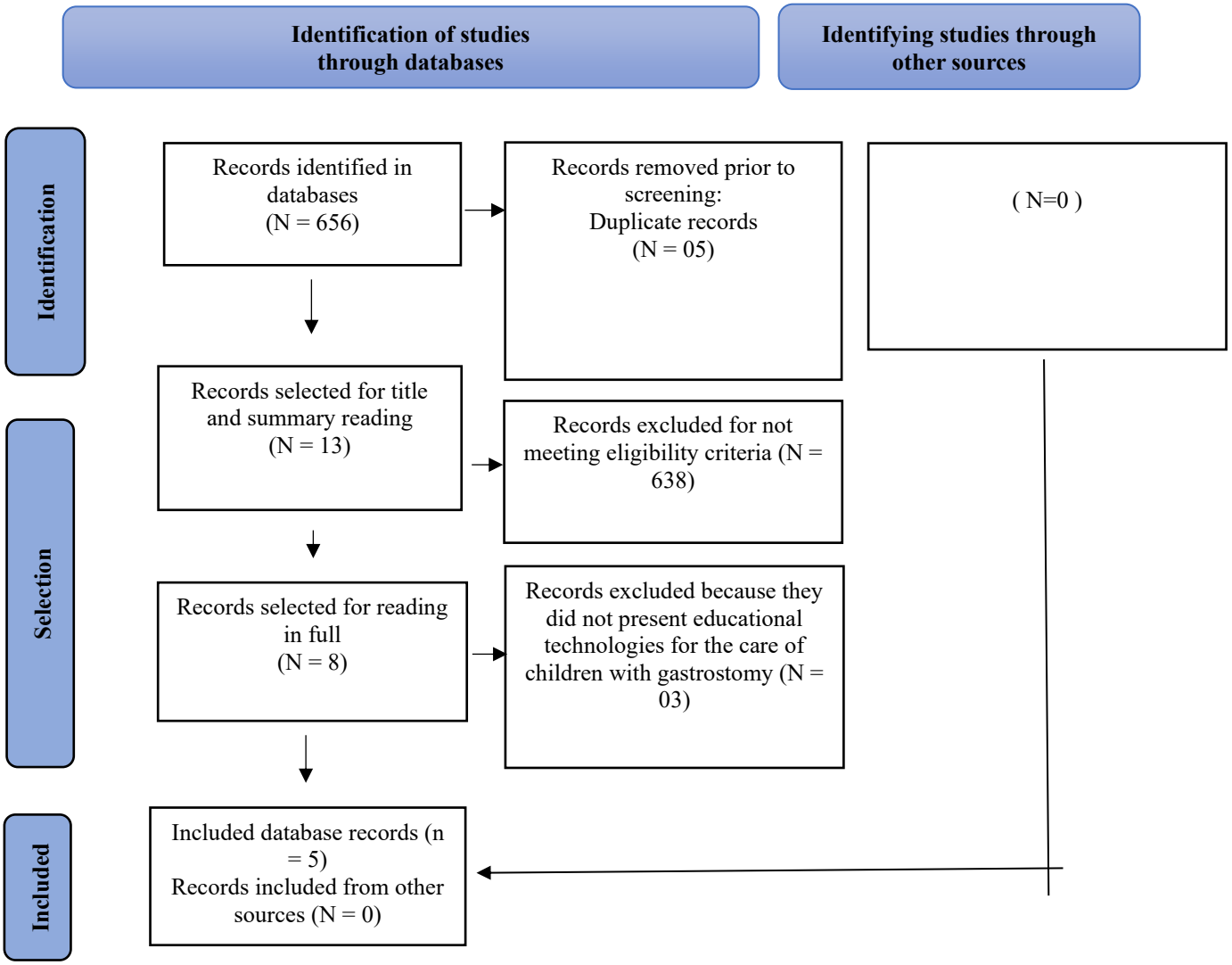
RESULTS

In the implementation of the search strategies in the selected databases, 656 scientific studies were found that addressed the gastrostomy theme. Electronic searches were performed in five

databases: LILACS, BDENF, MEDLINE, IBECS and Google Scholar. After eliminating the publications that were not related to the theme, 13 studies remained. After eliminating the duplicates, eight scientific papers were selected for reading in full. Of these, only five were included according to the eligibility criteria.

To visualize the selection and screening path of scientific studies for integrative review, the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analyses) tool was used, as illustrated in Figure 1.

Figure 1 - Illustrative flowchart of the screening and selection process of studies, based on the PRISMA recommendation. Best Time to See Fortaleza, Ceará 2022



Fonte: PRISMA (*Preferred Reporting Items for Systematic Review and Meta-Analyses*)

The reasons for the exclusion of publications (n=638) were: literature review and studies that did not answer the guiding question. These exclusions were necessary to ensure that only the most relevant and methodologically appropriate studies were included in the integrative review, ensuring the quality and relevance of the evidence analyzed.

The studies selected for inclusion were carefully evaluated for their general characteristics. The tables present these characteristics in detail, including information about the authors, year of publication, type of study, area of publication, and the main elements of the study. The tables allow a comprehensive and structured view of the analyzed works, facilitating the comparison and interpretation of the data.

Chart 1-Summary Table of Publications on Educational Technologies in Gastrostomy Care

No.	Authors	Title	Objective	Methodological Design
1	RODRIGUES, L.N. et al. Rev Bras Enferm., 2020.	Construction and validation of an educational booklet on care for children with gastrostomy.	To describe the process of construction and validation of an educational booklet aimed at caregivers of children with gastrostomy.	Methodological study in five stages: bibliographic survey; situational diagnosis; construction of illustrations, layout, design and texts; validation with experts and calculation of the Flesch Legibility Index; validation with the target audience. Content Validity Indexes and Suitability Assessment of Materials applied.
2	LIMA, P. S. et al. Reme: Rev. Enferm., 2018.	Educational manual for the care of children with gastrostomy: construction and validation.	Develop and validate an educational manual on gastrostomy care in children.	Bibliographic survey, content development and validation with 11 experts via the Delphi technique and with five parents/caregivers via the Likert scale.
3	LENGRUBER, M. R. et al. Research, Society and Development, 2021.	Elaboration and development of an educational video in health "Knowing the Gastrostomy".	Describe the creation of an educational video about gastrostomy.	Methodological study of qualitative nature, developed in three phases: pre-production, production, post-production
4	CALDAS, A.C.S. et al. Escola Anna Nery, 2019.	Sensitive and creative production of careful-educational technology for families of children with gastrostomy.	To produce educational technology based on Peplau and Freire models for families of children with gastrostomy.	Qualitative descriptive research with 13 family members, using semi-structured interviews, observation, and thematic analysis.
5	CRUZ, S. D. R. et al. Revista Enfermagem Atual In Derme, 2019.	Gastrostomy catheter in children: elaboration of standard operating protocols.	Develop and validate SOPs for gastrostomy catheter exchange and care.	Methodological method in two stages: construction of SOPs and validation by judges. Analysis included calculation of the Content Validity Index.

Source: Prepared by the authors with data from the research

Chart 2 - Results and Conclusions of Research on Educational Interventions for Gastrostomy Care

No.	Results	Conclusion
1	Content Validity Index of 0.93; Suitability Assessment of Materials of 85.2%; legibility of 72%. Material considered coherent and adequate by the caregivers.	Booklet validated as useful for caregivers, contributing to good practices in the care of children with gastrostomy.
2	Validation reached agreement of 97.91% of the experts; All caregivers totally agreed. Manual includes 21 pages, 8 chapters and 38 figures.	Manual considered valid for use, facilitating home care and prevention of complications.
3	First round of evaluation with CVI of 93%, second round with 97%; considered acceptable 80%.	Video serves as a didactic and technological tool for health education, filling knowledge gaps.
4	Development of a booklet based on identified problem situations, containing 24 pages and nine topics.	Booklet validated as a sensitive and useful resource for assistance and teaching.
5	SOPs on catheter exchange and care validated with IVCs of 0.87 and 0.83, respectively.	SOPs validated as effective, with modifications suggested and accepted for clinical practice

Source: Prepared by the authors with data from the research

The educational technologies most present in the studies were of a printed nature, including booklets, manuals and SOPs, followed by audiovisual technologies, such as videos. Four of the studies presented technologies in printed format and one used video as a tool for teaching. It was common among the studies to search for educational technologies already produced and published in the literature, as well as the discussion about the importance of educational approaches aimed at patients and caregivers. Some approaches include guidance that begins in the preoperative period.

DISCUSSION

The search for technologies aimed at gastrostomy in pediatrics was necessary to confirm the scarcity of published studies. Five publications focused on the care of children with gastrostomy were found, which points to a lack of studies published on this topic, evidencing an increase in publications related to educational technology in the last five years (LENGRUBER et al., 2021; RODRIGUES et al., 2020; CRUZ et al., 2019; LIMA et al., 2018).

Of the studies analyzed, the authors addressed complications when using the gastrostomy tube, home care, handling, bathing, hygiene, medication administration through the catheter, adequate replacement period, reasons for accidental exit, complications, and the experience of family members in the care of children with gastrostomy (RODRIGUES et al., 2020; CRUZ et al., 2019; LIMA et al., 2018).

It is noteworthy that printed and digital technologies (booklets, SOP and manual) were the most cited in the studies. It should be noted that some of the studies do not make clear the format of delivery of technology to caregivers or professionals, whether printed or digital. The only ones that demonstrated that the technology was printed were the studies of the elaboration of booklets, by

Rodrigues *et al.* (2020) and Caldas *et al.* (2019). Next, audiovisual resources (video) stand out, commonly studies use the combination of various methods for health education. It is believed that this issue is related to the possibility of these various strategies complementing each other in order to facilitate the process of guidance and education in health.

In the study by Rodrigues *et al.* (2020), which presents the construction and validation of an educational booklet, the authors highlight that printed educational technologies are considered viable methods in order to sensitize and educate the target audience, in addition to opening space for a collective construction of knowledge among professionals and the population, constituting the use of new resources for teaching-learning.

It is emphasized that the importance of the active participation of caregivers in the teaching and care process is fundamental, considering that an educational material has been prepared and will be intended for them, so the shared learning space between professionals and caregivers becomes indispensable for the success of the process, in addition to allowing the use of a language that is more accessible.

A study carried out by Lima et al. (2018) developed and validated a manual for the care of children with gastrostomy, as a focus of guidance for parents and caregivers of children with gastrostomies. The authors used accessible language, which aimed to make the content attractive and understandable.

Among the advantages of these methodologies used by nurses, the ease of implementation, accessibility to all levels of education and low cost stand out, being a resource of readiness available at home for consultation in the event of doubts (RODRIGUES *et al.*, 2020).

Printed educational technologies also have their disadvantages and limitations, such as the need to update in the face of constant changes in the health field. In this digital age, printed resources can quickly become outdated (WILL, 2022). However, this does not cancel out the use of printed resources, considering that not all people have access to the internet, or even know how to deal with such a tool.

In another study carried out by Cruz (2019), whose objective was to develop and validate two Standard Operating Protocols (SOPs), one for changing the gastrostomy catheter in children and the other for care with it, the results listed to address the topic were complications and care with gastrostomy, the difficulties and facilities in care for gastrostomy, and the experience of family members in the care of children with gastrostomy.

Lengruber's (2021) work, on the other hand, was to develop an educational video in order to fill the knowledge gap between lay people with a didactic and technological instrument for health promotion, since it brings together elements that are easy to understand through a creative dynamic.

Given the availability of printed, digital or audiovisual material, it is necessary to be presented in an accessible way to meet everyone's needs. Thus, it consists of one of the criteria for the validation of educational technologies, accessibility. For this, these materials must be prepared with simple and accessible language, easy to understand and interpret, both the presentation of the text and figures must be adequate to take advantage of the resource (RODRIGUES *et al.,* 2020).

Thus, by using educational technologies, it is possible to offer the public a solid base of knowledge for a better understanding of the information and the ability to form a critical opinion on a given topic.

It is suggested the construction and validation of other educational technologies capable of evaluating the long-term impact of these technologies on the quality of life of children and their families/caregivers.

CONCLUSION

The integrative review showed that the care of children with gastrostomy is complex and that there is a lack of studies on the standardization of techniques in relation to this care. In view of this finding, it is essential to conduct new studies on the subject, in order to support the care of patients with gastrostomy, especially children who need this procedure to achieve a better quality of life.

The information collected in the technologies presented can contribute to improving the care directed to these patients. The active participation of those responsible for care becomes indispensable for the success of the child's education, recovery and rehabilitation. It is also noteworthy the role of nursing in health education for caregivers of children with gastrostomy, especially related to complications and handling of the tube for feeding, cleaning and bathing.

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Healthy eating: Portugal's proposal to improve health through public health

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Devani Salomão[1]

ABSTRACT

This reflection is the result of the analysis of two Biannual Progress Reports that refer to the Integrated Strategy for the Promotion of Healthy Eating - EIPAS, which establishes as a priority "to promote health through Public Health, assuming as fundamental the policy of promoting healthy eating" (Order No. 11.418/2017, 29/12/2017).

Inadequate eating habits are one of the main risk factors for early mortality in the Portuguese population. Chronic non-communicable diseases (NCDs) - cardiovascular, diabetes, obesity and oncological - are diseases with a high prevalence in the Portuguese population, with cardiovascular diseases being the main cause of death in the country.

The aim was to expand the evidence related to healthy eating policy and form a basis for more specific future research.

Methodology: field research and bibliographic sources, as well as content analysis of two reports.

Results: In the content analysis, the categories that appear most often are "healthy eating", "communication" and "public administration". We observed the preponderance of the subject "healthy eating" in the texts of the reports. Communication had good emphasis. It is inferred that the Ministry of Health (public administration) intends to try to establish a common point in the narratives between experts and citizens, so that people can better understand and thus be able to decide on what is recommended in the various aspects of healthy eating and health, both in the material analyzed and in other media.

Keywords: Healthy eating, Public communication, Chronic diseases, Public policies, Public health.

[1] Postdoctoral fellow at the University of Minho (2022), Communication and Society Research Center - Institute of Social Sciences of the University of Minho, with the project "Integrated Strategy for the Promotion of Healthy Eating as a Public Policy in the prevention and control of chronic non-communicable diseases in the public health service of Portugal". Postdoctoral fellow at the University of São Paulo (2018) with the project "Public policies aimed at obesity control", when she analyzed the public communication of the Food Guide for the Brazilian Population as a public policy instrument in the prevention and control of chronic non-communicable diseases, specifically obesity. Postdoctoral fellow at the University of São Paulo (2014), with research funded by the National Council for Scientific and Technological Development (CNPq), whose theme was the investigation of the existence of sustainable management in pharmaceutical industries, analyzing the discourses and managerial practices in some multinationals in this sector. Postdoctoral fellow at the Methodist University of São Paulo (2011), UNESCO Chair in Communication for Regional Development and "Mayor Celso Daniel" Chair in City Management, an opportunity in which the functionality of the Manual for the Prevention of Falls of the Elderly, a communication vehicle of the Institute of Medical Assistance to Public Servants of the State of São Paulo, was analyzed. PhD (2005) and Master (1999) in Public Relations from the School of Communications and Arts of the University of São Paulo.

INTRODUCTION

This text is the result of the postdoctoral studies at the University of Minho, carried out between 2021 and 2023, resulting from the project entitled "Integrated Strategy for the Promotion of Healthy Eating as a Public Policy in the prevention and control of chronic non-communicable diseases in the public health service of Portugal", whose objective was, since the work is located in the area of public communication with an interface with public health, to show and analyze which were the communication media used to disseminate the four guiding axes of the Integrated Strategy for the Promotion of Healthy Eating (EIPAS) and why the members of the ministries involved opted for them, as well as what were the communication elements to disseminate their results.

According to the National Health Promotion Program - PNPAS, some factors are determinants of food consumption: age, sex, education or income are some of the variables that help explain different food consumption. The systematization of this information, in the future, is crucial for the creation of programs to promote healthy eating habits. It can be noted that in all analyses, socioeconomic factors, such as education level or employment status, seem to strongly influence the availability and/or access to health-promoting foods (General Directorate of Health [DGS], National Program for the Promotion of Healthy Eating [PNPAS], 2013. p.35).

The World Health Organization (WHO) recommends the daily consumption of at least 400g of fruit and vegetables, equivalent to approximately 5 daily portions of these foods. On the other hand, the effect of foods with high energy density on the growth and health of children, particularly obesity, has also been one of the most widely studied aspects, given the exponential increase in the availability of these foods in recent decades (DGS, PNPAS, 2014, p.35).

The most correct way to assess the nutritional adequacy of a population is through the direct and individual collection of information on food intake from population groups and representative samples of it. The last National Food Survey (IAN) with direct collection and methodology considered adequate, at European level, dates from 1980. When this is not possible, indirect methods are used to indicate food availability or household spending on food – data collected regularly by national institutions such as the National Statistics Institute (INE) that collect and produce statistical information (DSG, PNPAS, 2015, p. 16).

These are the main activities developed to achieve the strategic axes of the PNPAS: 1. promote epidemiological surveillance and research on food consumption; 2. Develop actions in the area of primary prevention, modifying the availability of food, promoting training and creating intersectoral articulation; 3. promote secondary prevention of obesity in adults (DGS, PNPAS, 2016/17, p.11-12).

Since December 29, 2017, Portugal has presented an Integrated Strategy for the Promotion of Healthy Eating (EIPAS) structured in 4 main axes. This strategy presents two main and innovative

challenges compared to previous intervention models in Portugal. On the one hand, a proposal based on the "health in all policies" approach with the formal commitment of various government sectors (agriculture, economy, finance, education, municipalities, sea). On the other hand, an intervention focused on modifying **the food supply by production and in public spaces**, instead of previous ones focused only on citizen education (Direção Geral da Saúde [DGS], Alimentação Saudável/ Desafios e Estratégias [Healthy Eating/ Challenges and Strategies, 2018 p.12).

Regarding EIPAS, there is a concern to ensure its proper implementation, promoting intersectoral work with the aim of promoting healthy eating in Portugal. Actions to be developed:

- Holding monthly meetings of the working group,
- Preparation of the 1st biannual EIPAS monitoring report (DGS, Healthy Eating/ Challenges and Strategies, 2018 p.21).

The publications mentioned above, according to the projections made there, showed that expectations in the expected results were high. Thus, following what was planned in the original project, we understood that a questionnaire would be an indispensable instrument to assess, together with the Ministries of Internal Administration, Agriculture, Forestry and Rural Development, Economy, Education, Finance, Sea and Health, participants in EIPAS, whether the prospects were proven. We made contacts, via e-mail, with the officials responsible for the content inherent to each ministry and asked for authorization for a videoconference, at which time they could answer questions that were their responsibility. All the civil servants, without exception, did not say no, but used subterfuges to avoid this dialogue.

One of the main reasons to obtain the maximum amount of information within a research project is the achievement of objectives, which makes this knowledge an input of special importance. The lack of good information can have disastrous consequences for the work, for the researcher and for the academic institution. Since the withholding of data from potential respondents generates a loss of time invested in trying to dialogue, funding from funding agencies, in the case of scholarship holders, and enormous frustration for researchers.

AFTER THE EVENT WITH THE SEVEN MINISTRIES, WE CHANGED THE PROCEDURES

We decided to carry out a content analysis of the documents that refer to the Integrated Strategy for the Promotion of Healthy Eating - EIPAS, created by Order No. 11418/2017, where the "XXI Constitutional Government, in its health program, establishes as a priority to promote health through a new ambition for Public Health, arguing that the achievement of health gains results from intervention in the various determinants in a systemic way, systematic, assuming as fundamental the policy of promoting healthy eating" (Order no. 11418/2017, 29/12/2017).

This Order also states: "Thus, in a logic of health in all policies, through Resolution No. 334/2016, of 15 September, the Council of Ministers created an interministerial Working Group for the elaboration of an integrated strategy for the promotion of healthy eating, which aims to encourage adequate food consumption and the consequent improvement of the nutritional status of citizens, with a direct impact on the prevention and control of chronic diseases, and he presented a proposal that now urgently needs to be approved through this order. Thus, the following is determined:

1. To approve the Integrated Strategy for the Promotion of Healthy Eating (EIPAS) contained in the annex to this Order, of which it is an integral part; 2. Ensure that EIPAS measures are implemented by the various services and bodies of the direct and indirect administration of the State competent according to their respective areas of activity and under the guidance of the respective tutelages; 3. The follow-up and monitoring of the implementation of EIPAS is carried out by the interministerial Working Group, created through Council of Ministers Resolution No. 334/2016, of 15 September, through the semi-annual presentation of progress reports" (Order No. 11418/2017, 29/12/2017).

THEORETICAL FRAMEWORK

WHAT IS HEALTHY EATING

As in the reports analyzed, from 2013 to 2020, of the National Program for the Promotion of Healthy Eating, not even the EIPAS reports bring a concept or definition of what they consider "healthy eating", we will use in this report the conception of the Action Framework for Developing and Implementing Public Food Procurement and Service Policies for a Healthy Diet, p. 2).

According to the WHO, the "primary objective of public health food procurement and service policies is **to set nutrition standards for food that is bought, served or sold with government funds**." "Healthy" can mean different things to different people, cultures, and environments. That's why this WHO Framework for Action outlines **five** basic principles of healthy eating that are universally relevant:

- Limit the intake of refined sugars;
- Change fat consumption from saturated to unsaturated fats and eliminate trans fats present in the industry;
- Limit sodium consumption and ensure that salt is iodized;
- Increase the consumption of whole grains, vegetables, fruits, nuts and legumes;
- Ensure the availability of free and safe drinking water.

Nutrition standards defined in Public Food Procurement (PFP) policies may include criteria based on nutrients, foods, or other measures related to food preparation or service.

FOOD: MULTISECTORAL AND CROSS-CUTTING STRATEGIES

The publication Healthy Eating in Numbers, by PNPAS, brings in the introduction: "Portugal was, until the beginning of this decade, one of the few European countries that did not have a National Food and Nutrition Policy, that is, a concerted and transversal set of actions aimed at guaranteeing and encouraging the availability and access to a certain type of food, with the objective of improving the nutritional status and promoting the health of the population. This is despite the fact that inadequate nutrition in Portugal is considered, in international reports, to be responsible for 11.96% of the total years of life prematurely lost, adjusted for disability, in females, and by 15.27% in males (GBD, 2013), expressed in DALY (Disability Adjusted Life Years) (DGS, Healthy Eating in numbers, 2015, p.7).

It is also in this publication that we have the statement: "this program is prepared based on several guidance documents from the World Health Organization - WHO and the European Commission and also the Brazilian and Norwegian food policies, the latter implemented since 1974. This new strategy for a policy in the area of food and nutrition considers the need to modify the determinants of food consumption that are far beyond the citizen's knowledge and desire for change, that is, in areas ranging from urban planning to food supply, expressed, essentially, from 2010 onwards (DGS, Healthy Eating in Numbers, 2015, p.7).

This new approach to the determinants of health in all policies is expressed in the Adelaide Declaration of 2010, emphasizing that the foundations of health and well-being are mostly **outside** the health sector, and it is therefore necessary to incorporate health as a central component in the development of all policies (DGS, Healthy Eating in numbers, 2015, p.8).

This conduct of the PNPAS is also in line with the European Commission's strategy in the field of health proposed by the *White Paper "Together for Health: A Strategic Approach for the EU 2008-2013",* which is based on the development of an intervention to improve the health of citizens in other policies, outside the health sector. In this sense, we believe that the modification of the determinants of food consumption requires the involvement of different sectors of society in the search for solutions to improve food consumption and supply. Multisectoral and cross-cutting strategies are therefore needed across all government sectors, the private sector, civil society, professional networks, media and organisations at all levels (national, regional and local). (DGS, Healthy Eating in Numbers, 2015, p. 8).

PUBLIC COMMUNICATION

Pierre Zemor, in *La Communication Publique* (1995), divides the theme into the following areas: A) in terms of the field and B) in terms of forms of public communication. A) Regarding the field: the author defines public communication as "formal communication that tends to the exchange

and sharing of information of public utility, as well as the maintenance of social bonds, and whose responsibility lies with public institutions" (1995, p.5).

Still within the field theme there is a subdivision that covers:

A.1. Nature of the messages of the powers and public service;

A.2. The complexity of the relationship with the "receiving" citizen, and

A.3. The general principles and practice of public communication.

PUBLIC MESSAGES HAVE THE FOLLOWING CHARACTERISTICS (A.1)

A.1.1. They are naturally complex, since they aim to contribute to the **regulation, protection or projection into the future**, which are the responsibilities of the public authorities. Regulation consists of ensuring the functioning and maintenance of the balance of the complex system that constitutes a modern country. In this sense, public messages serve the collective interest. Protection is composed of the security of goods and people. In a democracy, public messages convey the respective rights and duties of citizens and public institutions; The public power is responsible for **forecasting** and **planning**. Here the messages are very abstract, as they have general schemes, plans, budget forecasts, socioeconomic and legal studies, among others (Zemor, 1985, p. 6-10).

About his relationship with the "receiver" citizen (A.2.), Zemor says that the citizen is an ambivalent receiver. The 'public service customer' relationship is not correct, as it implies a customer/supplier relationship, which does not adapt to the logic of the public service. In this case, the supplier has no competitors, and the customer is both taxpayer and voter. The citizen cannot be just a user of the public service without recognizing that he has a decision-making role, even a limited one (1995, p. 13-15).

The author believes that the communication of a public institution supposes an exchange between a receiver that is also partly a sender. It is the active characteristic of the receiver that establishes communication. Passivity reveals a certain fascination with the authority of the public broadcaster (1995, p.15).

Regarding the scope of public communication, considering a possible performance as "marketing... of supply", Zemor argues that it is necessary to be convinced, that this is part of the good foundation of public policies and decisions [influencing demand and supply in the public field]. And if it is important for the public service to analyze the satisfaction and expectations of citizens, these studies aim to provide another evaluation of public policies, the quality of the relationship they maintain with their users, as well as the relevance of the information that is intended for them (1995, p. 17).

Zemor (1995, p. 17-22) also subdivides the general principles and practice of public communication (A.3) into:

A.3.1 Regarding the purpose and mediation of communication, the author believes that before assessing the promotional efficacy of advertising or the impact of television images and messages, those responsible for public communication question themselves about the adequacy of these means to the purposes pursued in the name of public utility (Zemor, 1995, p.18)

A.3.2 As for the types of communication, Zemor identifies: a) Information **and explanation**: linked to the legitimacy of the public message that passes information about the practical institutional functioning, or rules of the civic game;

b) Promotion or **enhancement of institutions or public service**: themes or recommendations called major social causes;

c) Discussion **or proposition of debate** on projects for institutional change, social choices and political offers (Zemor 1995, p.19).

A.3.3 As for the conditions of public communication, it is considered that it has to be a true communication, on the one hand with an active citizen and on the other with authentic institutions. On these two conditions rests the good relationship between public institutions and their users. The practical conditions of access to information tend to respond to the requirement of transparency of public acts.

B. As for the forms of Public Communication: public communication is assumed, in practice, in very variable forms according to the need to communicate. Certain communications have information as their objective.

According to Zemor (1995, p. 23) five categories of this type can be distinguished: B.1. Respond to the obligation of public institutions to provide information to the public;

B.2. Establish a relationship of dialogue, playing a role that belongs to the public service and allowing the provision of a precise service to those who are served;

B.3. Present and promote any of the services offered by the administration, territorial collectivities and public establishments;

B.4. Make the institutions known both through internal and external communication;

B.5. Conduct information campaigns, aiming at communication actions of general interest.

DIALOGUE AS A FORM OF EVALUATION

Listening and dialogue with users of public health services has the mission of making institutions aware of the users' opinion about their services, enabling a reassessment of public service offers.

The media can disseminate public data and, at most, encourage the interactivity of dialogues with public institutions, but rarely contribute to the direct analysis of complex issues. The most

important communication is that which takes place outside the media, where the user of the public service has the opportunity to express his opinion about the services offered.

Zemor (1995, p. 36) emphasizes the importance of the dialogue that is established in the public service as a result of an attitude rather than a regulatory disposition. Dialoguing with users is an essential way to evaluate public services.

Dialogue allows, on the one hand, the co-production of a personalized service that serves the user of the public service. When one hears a 'particular case', the citizen is given the quality of the 'social contract' with the public power, a priori overwhelming in his eyes. On the other hand, the exchange of information can draw attention to points of view that may have escaped more global concerns.

Elizabeth Brandão (1998) conceptualizes public communication as the process of communication that is established in the public sphere between the State, the Government and Society and that proposes to be a privileged space for negotiation between the interests of the various instances of power that constitute public life in the country (p. 12)

CITIZENSHIP IN HEALTH

Theoretically, the application of the concept of citizenship is essential for better social organization. Exercising citizenship is being aware of your rights and obligations, ensuring that they are put into practice. To exercise citizenship is to be in full enjoyment of constitutional provisions.

The edition of the **National Health Plan 2012-2016** presents the strategic axis called citizenship in health. It conceptualizes citizenship, active citizenship and citizenship and health:

Citizenship designates a status of member of a political community (local, national, supranational) for which there is a relationship of responsibility, legitimized by each person assuming rights and duties. Active citizenship, on the other hand, presupposes that people and organizations (families, communities, associations, companies) assume the responsibility of developing society, through actions such as public and political participation, associativism, volunteering and philanthropy (DGS, National Health Plan, p. 2).

Citizenship in Health emerges, in 1978, from the Declaration of Alma-Ata as "the right and duty of populations to participate individually and collectively in the planning and provision of health care" (Alma Ata, 1978) (DGS, National Health Plan, p. 2).

It also covers the role of the citizen, which would be: to be responsible for his own health and that of the society in which he is inserted, having the duty to defend and promote it, with respect for the common good and for the benefit of his interests and recognized freedom of choice (Basic Law on Health, 1990), through individual actions and/or associating and constituting institutions (DGS, National Health Plan, p.3).

Education, behaviour and lifestyles, management of chronic disease, appropriate use of health care, promotion of informal care, therapeutic alliance and adherence to therapy are key determinants for improving the health status and performance of the Health System (DGS, National Health Plan, p.3).

Citizens have the right to have public health services constituted and operated in accordance with their legitimate needs and interests (DGS, National Health Plan, p.3).

The citizen is the center of the Health System, meaning that the Health System must be organized with the mission of responding to their needs, satisfaction and legitimate expectations as an individual and as an element of a community, and in their various roles: active and healthy, sick, service user, consumer, caregiver, family and community member (DGS, National Health Plan, p.4).

If Portugal's Health System could really meet the demand of its citizens, taking into account an aging population, with several chronic diseases, impoverished (as the Covid 19 pandemic was responsible for the closure of several establishments) and still needing to have access to a lot of information about healthy eating, it would take a few years.

According to Bobbio, the Universal Declaration of Human Rights can be accepted as the greatest historical proof to date given of the consensus omnium gentium on a given system of values. The old natural law lawyers were suspicious - and not entirely wrong - of consensus as the foundation of law, since this consensus was difficult to prove. But now this document exists: it was approved by 48 States, on December 10, 1948, at the United Nations General Assembly; and, from then on, it was welcomed as an inspiration and guidance in the process of growth of the entire international community towards a community not only of States, but of free and equal individuals" (2004, p.18).

Bobbio continues, "I do not know if one is aware of the extent to which the Universal Declaration represents a new fact in history, insofar as, for the first time, a system of fundamental principles of human conduct was freely and expressly accepted, through their respective governments, by the majority of men living on Earth. With this declaration, a system of values is - for the first time in history - universal, not in principle, but in fact, insofar as the consensus on its validity and its capacity to govern the destinies of the future community of all men has been explicitly declared" (2004, p.18).

It is also Bobbio who states that "only after the Universal Declaration can we have the historical certainty that humanity - all humanity - shares some common values; and we can, finally, believe in the universality of values, in the only sense in which such a belief is historically legitimate, that is, in the sense that universal means not something given objectively, but something subjectively accepted by the universe of men" (2004, p.18).

With the Declaration of 1948, according to Bobbio, a phase begins, in which the affirmation of rights is at the same time universal and positive: universal in the sense that the addressees of the principles contained therein are no longer only the citizens of this or that State, but all men; positive in the sense that it sets in motion a process in which human rights should no longer be merely proclaimed or only ideally recognized, but effectively protected even against the very State that has violated them. At the end of this process, the rights of the citizen will have been transformed, really, positively, into human rights. Or, at least, it will be the rights of the citizen of that city that has no borders, because it comprises all humanity; or, in other words, it will be the rights of man as rights of the citizen of the world. (2004, 18).

We bring two articles from the Universal Declaration that speak directly to the theme of our research:

Article 25 - 1. Everyone has the right to a standard of living capable of ensuring for himself and his family health, well-being, including food, clothing, housing, medical care and the necessary social services, and the right to security in the event of unemployment, illness, disability, widowhood, old age or other loss of livelihoods in circumstances beyond his control.

Article 25 - 2. Motherhood and childhood have the right to special care and assistance. All children, whether born in or out of wedlock, shall enjoy the same social protection.

Article 26 - 1. Every human being has the right to education. Education will be free, at least in the elementary and fundamental grades. Elementary education will be mandatory. Technical-professional instruction will be accessible to all, as well as higher education is based on merit.

Article 26 - 2. Education must aim at the full expansion of the human personality and the strengthening of human rights and fundamental freedoms, and must promote understanding, tolerance and friendship among all nations and all racial or religious groups, as well as the development of United Nations peacekeeping activities.

Article 26 - 3. Parents have the priority of the right to choose the type of education to be given to their children.

We all have rights, which are guaranteed by the Declaration of 10 December, but how many of us can really enjoy them? The reasons for non-compliance with the articles are the most diverse, and at this time we are not going to analyze this matter.

PUBLIC POLICIES

According to Silva, health policies are central to the analysis of the contemporary welfare state: not only do they represent one of the main portions of social spending, along with pensions, but they also have universal implications throughout the life cycle. In addition, contemporary health systems are under similar tensions and pressures to those found in other social areas: continued

increases in spending, demographic pressures, cooling economic growth, and fiscal constraints (2012, p.121).

Silva envisions that the last decades have shown an evolution in changes in health policies. The work of several international institutions (OECD, World Bank, World Health Organization and European Union) marks a comprehensive look at health systems. The reports published by these institutions have established parameters for this area of public policies for evaluating systems focused simultaneously on sustainability and efficiency, on access and equity of health care delivery models and on the quality of services provided (2012, p. 124).

These parameters, according to Silva, have become a reference, not only to measure and compare, but also to promote changes in systems and policies. From this broader framework, we can therefore study changes in health policies and evaluate health systems around three major purposes: (a) sustainability and financial efficiency; (b) equity in access; and (c) quality of care and health status of the populations (2012, p.124).

PUBLIC HEALTH

Public Health can be defined according to its various dimensions that reflect its diverse societal images (Turnock, 2004). According to Turnock (2004, p. 8), there are five societal images of Public Health — simultaneously its dimensions:

- Public Health as a social system;
- Public Health as a profession;
- Public Health as a method of intervention (i.e., body of theoretical and practical knowledge);
- Public Health as a public service, ensured by State agencies and bodies;
- Public Health as the health of the public (i.e., intended outcome).

Given that Public Health integrates knowledge from the most diverse areas, including those that are considered its basic sciences (epidemiology, biostatistics, environmental sciences, economic sciences and behavioral sciences), its professionals differ both with regard to basic training and with regard to the activities performed (Turnock, 2004, cited by Almeida, 2010).

Despite the fact that epidemiology is the basic area of knowledge of Public Health, an epidemiologist is not inherently an actor in it; it is only when it has the capacity to apply epidemiological knowledge to control the health problems identified (Almeida, 2008a). The maximum value of epidemiology is only achieved when its scientific contributions are placed at the service of Public Health and result in improved health of populations (Koplan, Thacker and Lezin, 1999).

Public Health consists, above all, of a practice (Turnock, 2004), even if it is based on scientific evidence. Its multidisciplinary nature is both a strength and a weakness: it is a weakness given the absence of a common culture, but it is a strength in the face of the diversity of health determinants and the consequent need for the concurrence of different areas of knowledge and intervention in solving the problems identified (Turnock, 2004).

Thus, more than a professional group, Public Health should be understood as a "movement" (Turnock, 2004). This is an appropriate perspective if we consider the systemic nature of Public Health and its intended outcome dimension («public health»).

The objective of reducing disease and maintaining the health of populations (Fee, 1991 cited by Almeida, 2004b) stems from society's commitment to improving the health and well-being of populations (Rychetnik et al., 2004) by "externalizing" the benefits of scientific knowledge to as many individuals as possible (Turnock, 2004).

Public Health, as a practice, arises from the intersection between available knowledge and societal values (acceptability of a health problem), and intervention is planned when, in the light of available knowledge and technological tools, a given health problem "crosses" the boundary of what is acceptable in view of its technical vulnerability at a given time or societal context (Turnock, 2004).

Public health services exhibit a weak social protagonism and even lack of knowledge and lack of consideration on the part of the general public, their primary beneficiary (Turnock, 2004; Almeida, 2008a). On the other hand, its mission is not always clear in the eyes of its professionals, who come from the most diverse areas of knowledge, with different backgrounds and practices, but with a (unifying) mission.

METHODOLOGY

Based on secondary data, the sample is non-probabilistic and non-random. The interpretation of the results was based on the content analysis technique.

Among the specificities of content analysis, the categorical one was chosen, which allows the establishment of thematic connections with the literature chosen to address the theme. The subjects investigated were selected from selected entries in the 1st and 2nd semester semiannual Progress Reports of 2018. In this modality, the categories and text codes that emerge from the content were identified (Bardin, 2011). In the analysis stage of this study, the categories are supported by the proposed theoretical framework, being the result of the analog and progressive classification of the elements.

In both Reports, the text is developed seeking to achieve three objectives. The **first**: that inadequate diet is, in Portugal, one of the risk factors that most contributes to the loss of healthy

years of life. The **second** is that: chronic diseases associated with inadequate eating habits, such as cardiovascular diseases, diabetes, obesity and oncological diseases, are diseases with a high prevalence in the Portuguese population, with cardiovascular diseases being the main cause of death in Portugal. The **third** is this: considering this epidemiological scenario, it is urgent to invest in the area of promoting healthy eating, and the definition of an integrated strategy in this area is the great challenge that arises.

THE CONTENT ANALYSIS OF THE REPORTS

We used the content analysis technique as a method to evaluate the data obtained in the EIPAS Reports, from the 1st and 2nd semesters of 2018. We deal specifically with the objectives of axes 1, 2 and 3, the general framework, the main results achieved, as well as the conclusions. We chose these documents because the respective reports are available for free access and are official documents of the National Health Service, regarding EIPAS and its applicability.

TOPICS ANALYZED

By following these steps, we define the following themes of analysis: promoting healthier eating has been one of the priorities of the XXI Constitutional Government; Council of Ministers Resolution No. 334/2016, approved by Order No. 11418/2017 of 29 December; encourage adequate food consumption and the nutritional status of citizens; direct impact on the prevention and control of chronic diseases. These, according to Bardin (2004), do not constitute only a linguistic order, but also a psychological one: they can indicate a theme, a statement, an allusion. Doing a thematic analysis consists of discovering the "nuclei of meaning" that make up communication and whose presence or frequency of appearance can mean something for the analytical objective.

FINAL CONSIDERATIONS

In relation to the categories analyzed, we observed that the concern with diseases and the Mediterranean Diet are lower in relation to the other themes that appear in these publications. This portrays, in part, that these issues are in the focus of the Ministry of Health, but are not the priority at the moment. As for public communication, as the subject is of public interest, it is deduced that it assumes greater importance, as it aims to promote the well-being of individuals.

Figure 1 – Mentions to the analysis categories

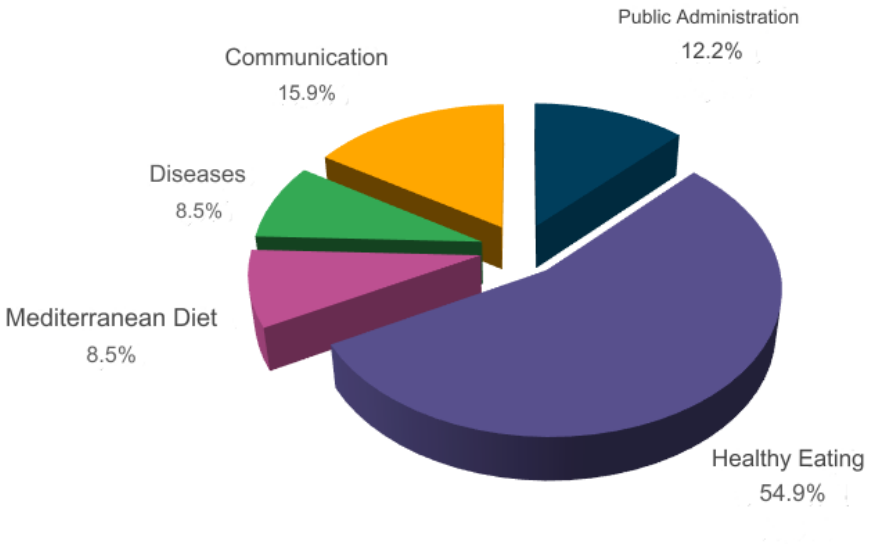


Figure 2 – Mentions to the codes of the Healthy Eating category

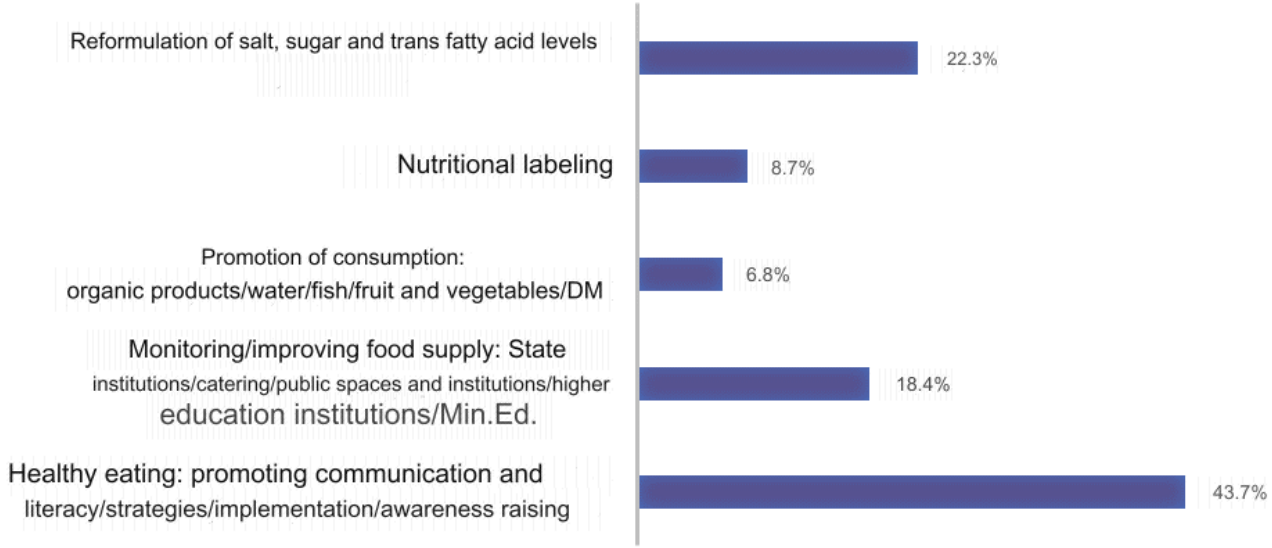


Figure 3 – Mentions to the codes of the Mediterranean Diet category

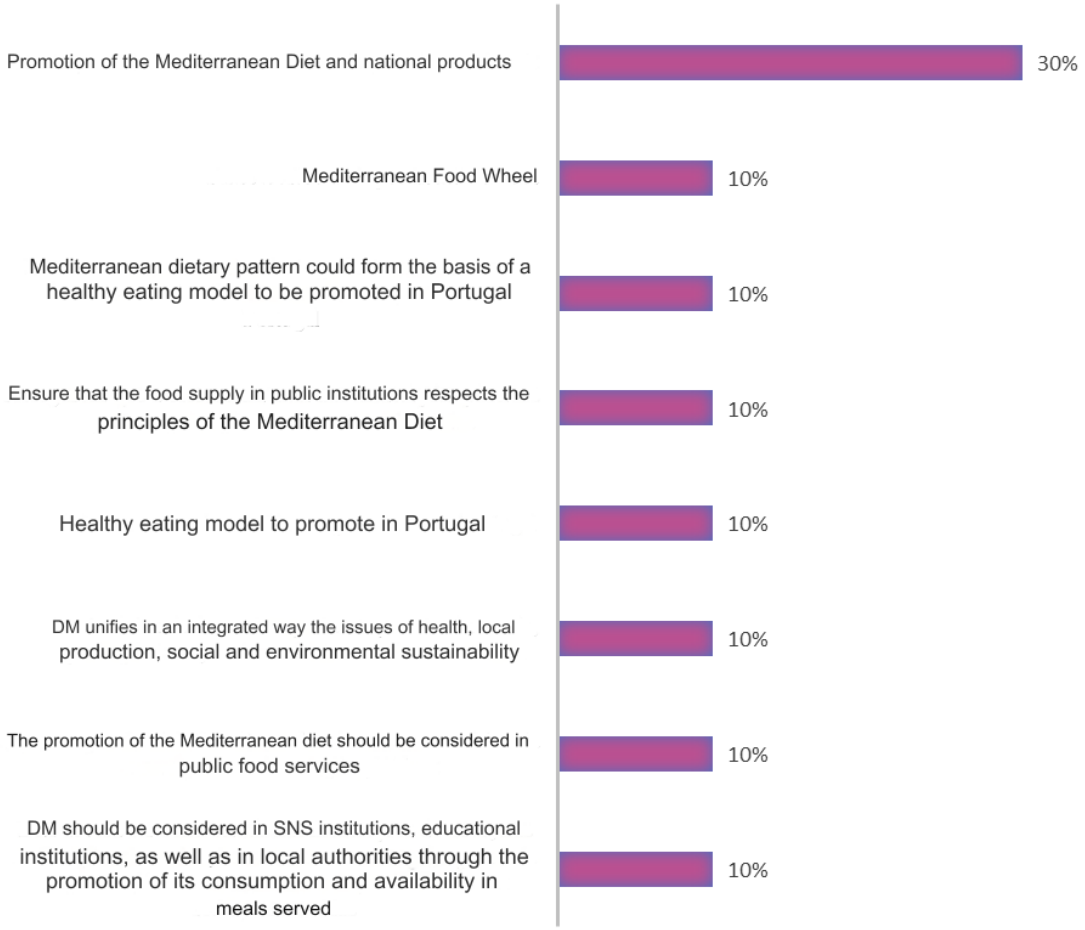
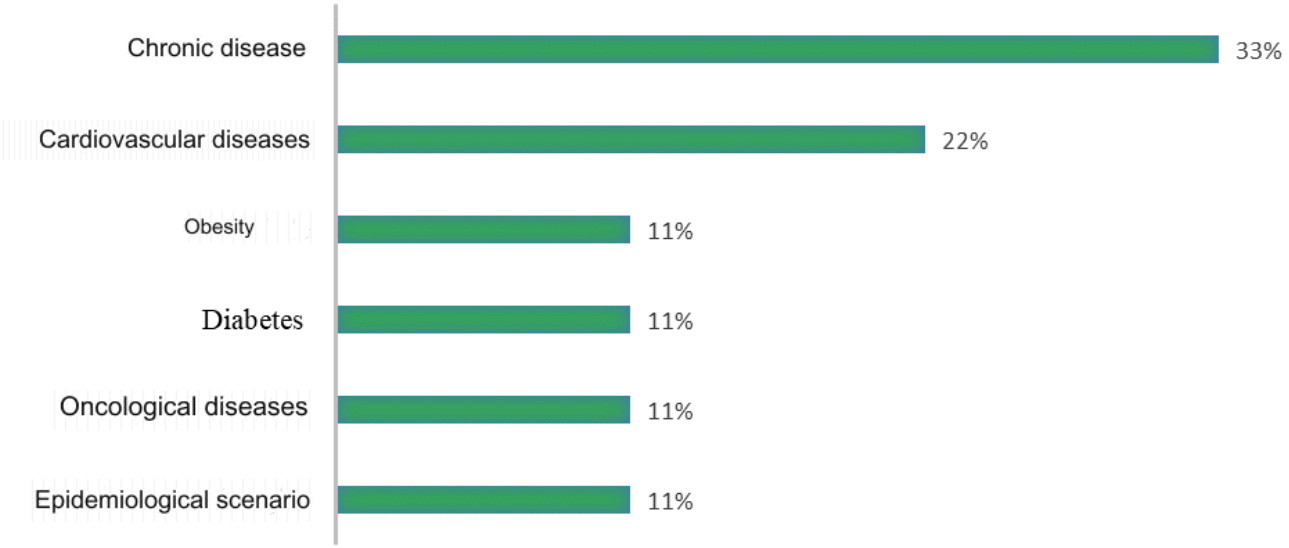


Figure 4 – Mentions to the codes of the Diseases category



When dealing with the Public Administration category, we notice that the Protocol set for promotion/monitoring/cooperation between the General Directorate of Health - DGS and other public and private bodies aimed at reducing sugar/salt/trans-fatty acids in food and packaging, added

to the Reformulation of food products and the Implementation of EIPAS/drinking fountains reach 69.8%. The three together represent practically everything that is included in EIPAS.

With regard to the codes of the Healthy Eating category, the group Healthy Eating: promotion of communication and literacy/strategies/implementation/awareness and Reformulation of salt, sugar and trans fatty acid contents, totaling 66%, is instigating, because communication, literacy and awareness are highlighted. Aligned are three important elements. We understand that the ability to use reading and writing as a way to acquire knowledge, develop one's own potential and actively participate in society, will lead to better awareness and communication of the citizen.

Figure 5 – Mentions to the codes of the Communication category

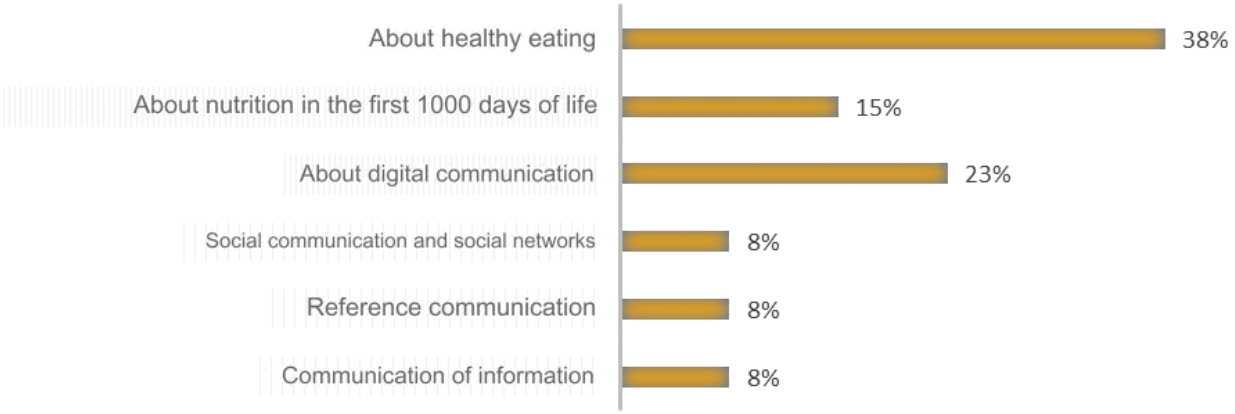
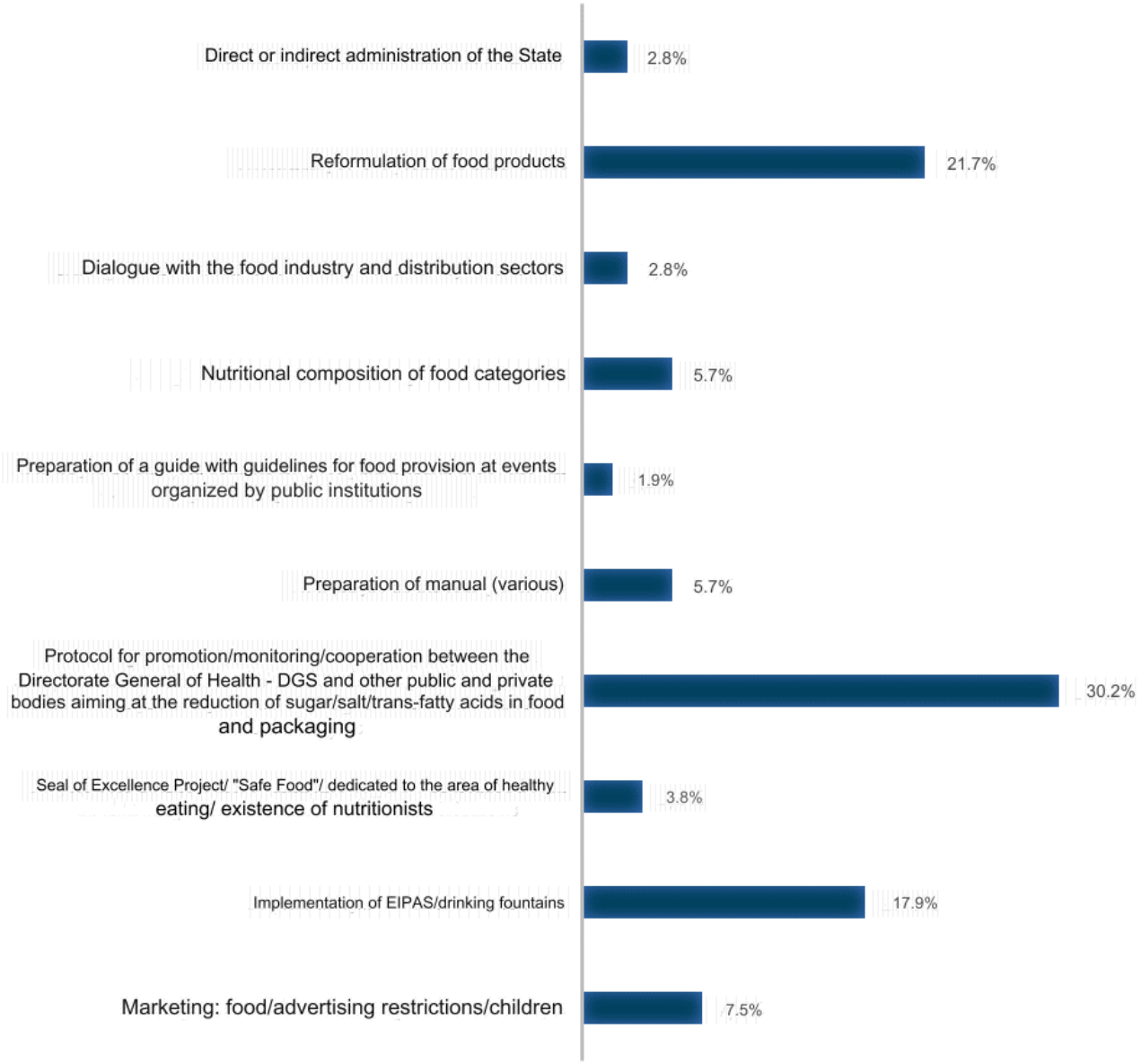


Figure 6 – Mentions to the codes of the Public Administration category



Analyzing the communication from the Ministry of Health, made by the Interministerial Working Group created by the Council of Ministers Resolution No. 334/2016, of September 15, we see that it is, according to Zemor, a "marketing of supply", since "it is necessary to be convinced that this is part of the good foundation of public policies and decisions [to influence demand and supply in the public field]". There is no reference in the objects of analysis (reports) as to "analyzing the satisfaction and expectations of citizens" on the part of the ministries. Zemor states that these studies aim to provide another assessment of public policies, the quality of the relationship they maintain with their users, as well as the relevance of the information that is intended for them (1995, p. 17).

As for the type of communication, we infer that communications are a mix "of promotion or appreciation of institutions or public service: themes or recommendations called great social causes;

and Discussion or proposition of debate of projects for institutional change, social choices and political offers. (Zemor 1995, p.19).

As for the exercise of citizenship in the context of health, we deduce that "although citizens have the right to have public health services constituted and operated in accordance with their legitimate needs and interests", which is proclaimed by the National Health Plan 2012-2016, on page 3, this is not consistent with the reality of Portugal. It is a utopia, as it would require a practically inexhaustible investment in human resources, technology, physical spaces, etc.

Regarding the change in eating habits during the COVID-19 pandemic, it is not our intention to explore this subject currently. The PNPAS in its summary brings "COVID seems to have contributed to a change in the eating habits of a significant part of the national population surveyed. Almost half of the population surveyed (45.1%) reported having changed their eating habits during this period and 41.8% have the perception that it has changed for the worse."

As we are fresh out of this pandemic, it will take some time for people to return to their healthy eating habits.

Public health policies in Portugal, when analyzed around three major purposes: (a) sustainability and financial efficiency; (b) equity in access; and (c) quality of care and health status of the populations (Silva p.124).

It is notorious that the number of Portuguese who pay for health care in the private sector has increased, in view of the delay in carrying out consultations and exams in the National Health Service.

Public health services are still in need of the adoption of digital tools. However, your executives should be aware that investment is necessary. In addition to the reduction of operating costs, due to the low cost of using some of the new technologies, the possible gains in terms of personalization of care, the speed and accuracy of the diagnosis of a given pathology, the ability to prognosis the health status of patients and the prediction of changes in the human body that could cause serious problems in the future, justify these tools by themselves.

In countries with great socioeconomic differences, it is utopian to refer to the universality of the health system, as well as the same quality of treatment for the entire population. Those with greater purchasing power have more access to cutting-edge interventions; as well as the quality of the procedures depends on the user's financial resources.

Those who work in the Public Health System of Portugal have made an effort to improve care and services, despite the few financial resources allocated to them. The Covid 19 pandemic required superhuman efforts in serving more people, there was a substantial increase in users who sought the service as a result of unemployment and other issues. Knowledge in the health area is uninterrupted, because there are scientists concerned with drugs for the prevention and cure of

diseases that today claim the lives of thousands of people; of new behaviors that are feasible for the population in general, making it less vulnerable and preventing it from the infinity of diseases that result from lack of knowledge of how to proceed.

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Effects of different packages on broccoli integrity and quality: A scientific approach

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Valdeir de Oliveira Guimarães[1], Vitória Jakeline Ornelas e Silva[2], Gabriela Andrade Alves[3], Ana Paula C. de Oliveira[4] and Fabrícia Queiroz Mendes[5]

ABSTRACT

Broccoli, as it is a vegetable rich in moisture, is extremely perishable and its commercialization faces problems due to this short shelf life. Packaging and coatings become great allies in the conservation of this product for a longer period. Thus, the present study aimed to evaluate the influence of the use of different types of packaging and edible coating on the conservation and quality of broccoli. The vegetables were arranged in plastic film and parchment paper packages and, for another treatment, a starch-based coating was produced. The treatments were evaluated on day 0 and also on day 7 in terms of mass loss and also in relation to color. The data were analyzed using Tukey's mean test of 5% probability. The results showed the lowest percentage of mass loss for broccoli packed with plastic wrap and the highest average was found for vegetables that were coated with starch solution. Regarding the color parameters, no significant differences were detected for the treatments. However, visually, the broccoli submitted to starch coating showed less color variation. Finally, it was concluded that more satisfactory results were found for vegetables packed with plastic film, as they presented less mass loss. On the other hand, visually, starch-coated broccoli has greater conservation in the color of the product. Therefore, it is suggested to combine both treatments to obtain more advantageous results.

Keywords: Broccoli, Conservation, Packaging.

[1] Bachelor of Science in Food Science and Technology
Federal University of Viçosa – Rio Paranaíba Campus
[2] Bachelor of Science in Food Science and Technology
Federal University of Viçosa – Rio Paranaíba Campus
[3] Bachelor of Science in Food Science and Technology
Federal University of Viçosa – Rio Paranaíba Campus
[4] Agronomist
Federal University of Viçosa – Rio Paranaíba Campus
[5] Doctor in Agricultural Biochemistry
Federal University of Viçosa – Rio Paranaíba Campus

INTRODUCTION

Horticulture involves a variety of products of great importance in human food, meeting the demands arising from population growth. Broccoli (*Brassica oleracea*) of the branch type is cultivated in all regions of Brazil. It has stems with smaller diameter and lateral branches, its commercialization takes place in bunches. The inflorescence has flower buds that are less compact, more open and larger (LUENGO and CALBO, 2009).

The start of the broccoli harvest occurs about 90 days after sowing and, depending on weather conditions, the cultivar cycle can be shorter or longer. The harvest takes place manually and certain care is essential to obtain a good quality in the product. Therefore, the ideal is to be harvested in the cooler periods of the day (ALMEIDA, 2019).

Broccoli is a highly perishable vegetable, with a higher respiratory rate among the others, requiring greater care in marketing. Post-harvest losses pose a significant challenge. Deterioration during storage and transportation can lead to loss of quality and food waste (VALERO and SERRANO, 2010).

A limiting cause in the post-harvest storage of broccoli includes the loss of fresh mass associated with firmness (wilting) and the loss of green coloration, as a result of yellowing of the florets. Its senescence helps in the physiological changes initiated soon after harvest; due to the high ethylene production and respiratory rate, with the use of technologies it can extend its useful life (GIOPPO, *et al*, 2011).

To address this issue, the development of effective conservation technologies is needed. Good post-harvest practices are indispensable for offering quality vegetables to the consumer market, having access to fresh and high quality products. Edible packaging and coatings are promising technologies to reduce post-harvest losses in vegetables. Packaging offers physical protection against mechanical damage and contamination, while edible coatings, such as cornstarch, have demonstrated the ability to reduce moisture loss and minimize oxidation (ROJAS-GRAÜ, RAYBAUDI-MASSILIA and MARTÍN-BELLOSO, 2008). With this, it maintains the quality of the product by reducing water loss, delays deterioration, change in color and firmness.

Recently, there has been an increase in interest in the application of these innovative technologies in vegetables. This is because edible packaging and coatings are a sustainable approach to preserving the quality and extending the shelf life of these highly perishable products. These technologies have the potential to positively impact the food industry and sustainability by reducing food waste and environmental impacts. Therefore, this study aims to evaluate the influence of the use of different types of packaging and edible coating on the conservation and quality of branch broccoli.

MATERIAL AND METHODS

In the conduction of the experiment, 24 experimental units of broccoli, with an average weight of 100 g, from the region of Rio Paranaíba, Minas Gerais, were used. The broccoli was selected based on quality criteria, such as color, size, and absence of physical damage. These were divided into four treatments, the control (without any packaging), wrapped in parchment paper, wrapped in plastic film and coated with 3% m/v starch coating. For all experimental units, a Styrofoam tray was used.

The preparation of the edible starch coating was carried out according to the method described by Rojas-Graü, Raybaudi-Massilia and Martín-Belloso (2008). The concentration of corn starch used was 3% mass/volume. 60 g of corn starch was weighed and transferred to a 2 L beaker, then 1940 g of water was added to the beaker under stirring for homogenization. The starch solution was heated on a heating plate and under constant agitation until it reached a temperature of 70 °C. The solution was kept at 70 °C for 5 minutes, after the heating time the solution was cooled until it reached an ambient temperature of 32°C. The coating was applied by immersing the broccoli in the solution and placed to dry in Styrofoam trays.

All experimental units were stored in a refrigerator for a period of one week. Mass loss was evaluated by the difference in mass on the first day and the 7th day after storage in the refrigerator; the color change using a tristimulus colorimeter, Delta Vista model. The parameters L*, a* and b* were determined.

The data were submitted to ANOVA and the means were compared using Tukey's test, with a significance level of 5%. The software used was Speed Stat version 3.2.

RESULTS AND DISCUSSION

The means for the percentage of mass loss observed for each treatment in relation to the analysis time are presented in Table 1.

Table 1: Mean Percentage of Mass Loss for Each Treatment

Treatments	Medium
Starch	39.72a
Control	29.49ab
Parchment paper	23.21b
Plastic film	6.55c

Means followed by different letters differ from each other by Tukey's test at 5% probability of error.

From the results found, it is noted that the lowest mass loss was observed for broccoli packed with plastic film, differing statistically from the other treatments. Broccoli that was only coated with starch showed the greatest loss of mass, proving that, for this requirement, the best conservation of

this food is due to packaging that surrounds the product and serves as a barrier mainly to water loss, which is aggravated by the cooled environment in which this vegetable is commonly stored.

Padula *et. al*. (2006) when evaluating the influence of different types of packaging on the physicochemical characteristics and gaseous composition of broccoli, they found that polypropylene packages had an average mass loss of 0.92%, samples packed in acrylic with open channels was 0.55% and those packed in sealed acrylic was 0.26%. The same behavior can be observed between the study presented and the one carried out in this work, since the more sealed and impermeable the packaging, the lower the tendency for mass loss, since there will be a lower gradient of water potential.

Carvalho and Clemente (2004) used a bioriented polypropylene polymeric film to evaluate the postharvest quality of broccoli in the control treatment, which did not have packaging. In this way, the film acted as a barrier, reducing the exchange of gases between the product and the atmosphere and extending its useful life.

The means for the variation of parameters L, a* and b* between the 7 days of analysis are shown in Table 2. L represents luminosity, ranging from 100 (white) to 0 (black) a* defines the transition from green (-a*) to red (+a*) and b* represents the transition from blue (-b*) to yellow (+b).

Table 2: Means of the variations of the L, a* and b* parameters between the days of analysis

Treatments	Parameter averages		
	L	the*	b*
Starch	-1.84a	3.92a	-0.31a
Control	-4.27a	3.44a	2.68a
Parchment paper	-11.09a	2.55a	11.35a
Plastic film	-9.06a	2.42a	11,12a

Means followed by different letters differ from each other by Tukey's test at 5% probability of error.

Regarding color analysis, it was observed that it was not possible to detect significant differences in any of the three parameters. However, it is worth noting that in the parameter b*, where +b indicates the yellow color, there was a positive variation mainly for broccoli packed with plastic wrap and parchment paper, and these, also visually, presented a more yellowish color than in the other treatments. Similarly, broccoli that was coated with starch solution visually showed greater conservation of green color (parameter b-).

By performing a pigment analysis of broccoli leaves, flowers and stalks, Padula *et. al.* (2006) observed in their experiments a degradation of chlorophyll *A* and *B* during the entire storage period, with greater decreases in values in the packages that had greater interaction with the external environment. And despite such a decline, in most cases the statistical analyses did not show significant differences, as is the case of the present study.

Gioppo (2011), when evaluating different environments and regulators in the postharvest of broccoli, found that the treatments did not obtain significant differences in the color analyses performed. This factor was explained due to the low temperatures, since cold storage provides less metabolic activity and consequently, less degradation of chlorophyll.

Finally, it can be inferred that for more satisfactory results, it would be interesting to combine the two different treatments that stood out in the analyses carried out: plastic film, in the case of less mass loss and starch coating, in the case of greater color conservation. Thus, the association of both treatments would become an alternative for better conservation of broccoli in relation to its metabolic activity, in addition to becoming more attractive to consumers for a longer period of time.

CONCLUSION

The use of plastic film proved to be more efficient in the conservation of broccoli, since it showed a lower percentage of mass loss when compared to the other treatments. Regarding the color analysis, it was not possible to find statistical differences between the treatments, however, the starch coating presented, visually, good results for the color conservation of the vegetable. It is therefore suggested, for future studies, the combination of these two treatments, as an alternative to obtain even more satisfactory results.

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Maker Culture: A cost-effective approach

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José César Pontes Moreira[1], Márcia Maria Siqueira Vieira[2] and Josué Gustavo Silva[3]

ABSTRACT

Maker culture has emerged as a social movement that emphasizes the personal production of material goods as opposed to mass industrial production. The aim of this study is to investigate the application of the economic approach in maker culture analysis. Economic analysis can provide a range of insights into the nature of this movement, as well as the implications for society and the economy as a whole. For this, a bibliographic survey was carried out, 30 articles, magazines and books were reached, first; After an analysis of the abstracts and keywords, 20 studies were selected. This is a qualitative-quantitative and exploratory analysis. The study demonstrates that maker culture has a significant impact on the economy, mainly through the creation of new jobs, as well as through the promotion of innovation and technological development. However, the lack of financial investment can be a major obstacle to the expansion of this crop.

Keywords: Maker Culture, Economic Approach, Entrepreneurship, Innovation.

[1] Doctor in Education (UFC), Master in Rural Economics, MBA in Economics, Finance and Market, Specialization in Rural Education, Graduated in Economic Sciences and Pedagogy. Researcher in the following areas: economics, educational technologies, economic development and cooperativism.
E-mail: cesarecon07@hotmailcom
[2] Doctor student in Science and Mathematics (ULBRA-RS). Master in Computing Applied to Educational Informatics (UECE). Specialist in Methodology in the Initial, Final and High School Years (UVA). Graduated in Pedagogy (UECE).
Email: marcia.siqueira@educacao.fortaleza.ce.gov.br
[3] Graduating in Economic Sciences (UFC) and researcher in economic development.
E-mail: silvajosuegustavo@alu.ufc.br

INTRODUCTION

An economic system is defined by the mode of production on which it is based, integrating the productive forces and the social relations of production. The productive forces are the set of techniques, specializations, organizational and administrative knowledge, production spaces, machinery, natural resources, among others. Social relations of production, on the other hand, are a concept that refers to the relationship between the agents that are at the heart of the production process, including those who control the social surplus, that is, the surplus part of material production after deducting production costs (MARX, 1996).

Since the pre-capitalist arrangements, especially with the expansion of long-distance trade and the emergence of the Great European Navigations from the fifteenth to the seventeenth century, the issue of productive surplus has been at the center of the economic system in advent, since trade comes from goods and services produced beyond the consumption needs of a set of people and/or society. However, it is in the consolidation of capitalism, essentially in its industrial phase, in the second half of the eighteenth century, whose division of labor and, consequently, the sustained increase in productivity, raises the production of the social surplus to levels never seen before (FIGUEIREDO, 2019).

In this period, manual production ceased to be the protagonist in the manufacturing process, and the use of machinery massified the availability of goods and services, without, however, establishing measures for the preservation of natural resources essential to the production chains that are disseminated throughout the global market. Thus, from the second half of the eighteenth century to the last decades of the twentieth century, the capitalist system rooted in the productive daily life of the different nations that adopted it was almost entirely conditioned to the principle of economic linearity. That is, the growing extraction of resources from nature, the transformation of these into goods to be traded and, by construction of the system itself, their disposal in the form of waste or tailings (FIGUEIREDO, 2019).

However, this conjuncture took little into account the finite existence of mineral and energy resources, causing social, political and economic issues that even threaten the existence of the linear economic model itself. Such problems, for example, are linked to the depletion of *indispensable commodities* in the production process, to the waste of energy, to the pollution of air, water and soil, and to negative externalities that promote the reduction of well-being and the amplification of inequalities in vulnerable groups (FOUNDATION, 2014).

To clarify, *commodities* are basic products, not industrialized, and their prices are determined by the forces of supply and demand in the international market.

In response to the negative issues and instability caused by the linear economic model of production, new approaches emerge, and the outline of a system whose structuring characteristic is

based on the paradigm of circularity, anchored in principles of economics. In other words, the birth of an economic model based on circular premises, which excels in the reuse of waste and the promotion of sustainable growth, combined with new processes and restorative and regenerative technologies.

This movement in favor of a circular economy, whose debates in these first decades of the twenty-first century have been intensifying at a national and global level, especially with the effects of climate change, has as an ally another practice with common characteristics: the maker culture. Both concepts value creativity, innovation, and collaboration and aim to promote sustainability and reduce inefficient use of resources and pollution (STAHEL, 2019).

The maker movement, in the contemporary and post-war context, specifically, starts from the idea that individuals are capable of creating, altering, and restoring objects, encouraging creative solutions to problems, knowledge sharing, and new approaches to solid waste. In this way, the popularization of maker culture has the potential to revolutionize the way we produce in society. According to Cordova and Vargas:

> The maker movement is based on the philosophy of 'Do it Yourself' (DiY) and 'Do it with Others' (DiwO) and is based on the idea that ordinary people can build, repair, modify and manufacture the most diverse types of objects and projects with their own hands (CORDOVA; VARGAS, 2016, p. 2).

The *maker* movement has deep roots in post-war culture, when the emphasis was on reconstruction and recovery after the ravages of World War II. During this period, there was a push for self-sufficiency, the recycling of materials, and the creation of household objects due to the scarcity of resources (HATCH, 2014).

People began to realize that they could repair, build, and improve things on their own, often using recycled materials. This post-war period influenced the DIY mentality that is still evident today. Within the contemporary context of the maker movement, Ribeiro (2019) reports that the maker movement, as we know it today, has flourished in recent decades in Brazil.

This is largely due to technological advancement, which has provided more affordable tools such as 3D printers, laser cutters, microcontrollers, and *design software*. That is:

> Many schools have used the idea of maker culture to resignify teaching and improve Education, investing in differentiated learning environments, where students can express their creativity and participate in interdisciplinary experiences and projects [...]. The activities developed through maker projects have a real social impact, as they help students develop creative and effective solutions to real everyday problems. (ROSSI; SAINTS; OLIVEIRA, 2019, p. 1).

These technologies have allowed Brazilian *makers* to go beyond traditional craft skills and expand their reach into electronics, programming, and digital fabrication. Thereby:

> The maker movement is based on the philosophy of 'Do it Yourself' (DiY) and 'Do it with Others' (DiwO) and is based on the idea that ordinary people can build, repair, modify and manufacture the most diverse types of objects and projects with their own hands (CORDOVA; VARGAS, 2016, p. 2).

According to Oliveira, Santos and Souza (2018, p. 25), "in Brazil, knowledge sharing and collaborative culture play an essential role in the *maker movement*". Online platforms, *maker* groups and *makerspaces* have multiplied, allowing Brazilians to share projects, tutorials and ideas, learn from each other and collaborate on joint projects.

According to Carvalho and Bley (2018, p. 26), "makers have in common the use of digital tools to create products and the sharing of information and collaboration in online communities". Therefore, makers, in addition to creating, adapting or transforming a certain artifact, they share their ideas to collaborate with new projects.

The *maker* movement values the idea that anyone, in the Brazilian context, can create, innovate and become an inventor, designer and manufacturer. *Brazilian makers* also stand out for their ability to customize projects according to their needs and preferences, creating unique products adapted to personal taste.

> One of the goals for students with the use of the maker movement at school is to make them more attentive, balanced, positive students, while carrying out collaborative and creative activities helping them to work in spaces where their passions and interests develop (ZYLBERSZTAJN, 2015, p. 9).

Kumar (2006, p. 52) states that "a new information society, despite all its tensions and problems, should be welcomed and celebrated not only as a new mode of production, but as a complete lifestyle".

The transition from a linear model to a production system based on circularity depends, above all, on the social perception that new paradigms are needed for the preservation of the environment and mineral and energy resources. These paradigms are the protagonists of *which maker spaces* play a leading role in promotion, whether in the condition of social projects that they promote in a playful way, or in school disciplines of laboratories that take the form of teaching-learning.

Maker culture has gained increasing popularity as a social movement that values the individual production of goods through the use of technologies that allow the creation of physical objects from scratch. In this sense, maker culture can be seen as a movement that encourages entrepreneurship, technological development, and innovation.

According to Roberto de Souza Pinto, president of the Union of Electrical, Electronic and Similar Appliances Industries of the Electronics Valley (SINDVEL), "the supply of the Electronics Valley is not normalizing and companies are hostage to the import of raw materials, we need to buy

chips, semiconductors and many other items and there is no regular supply" (VALVERDE, 2022, [n.p.]). The industries in the electronics sector suffered during the Covid 19 pandemic:

> A survey carried out last month by Abinee, the association that brings together manufacturers of devices such as cell phones, notebooks, tablets and TVs, shows that 73% of members report difficulties in acquiring components. This explains why 20% of companies are working with lower-than-normal parts inventories. In March, in a brief sign of improvement, the percentage of manufacturers who faced difficulty in purchasing inputs fell to 66% (EXAME, 2021, [n.p.]).

The government needs to design a program for the development of productivity in the productive sector supported by investments in the sector of production goods (machinery, equipment and tools) and inputs, so that the national industry can grow, generate income and give social sustainability to the development program, safeguarding the environmental ecosystem in all its dimensions.

According to studies by the Institute of Studies for Industrial Development (IEDI), presented in a letter published on the electronic portal, in 2019, there are challenges to be overcome:

> Competitiveness problems are of the most varied natures, including systemic cost factors, such as interest rate levels detached from the international reality, scarce sources of long-term financing, complex and onerous tax system, insufficient and deficient infrastructure; and modest productivity gains due to the low investment environment in which the country finds itself. All of this is punctuated by long episodes of exchange rate overappreciation (IEDI, 2019).

In this study, we seek to analyze the contribution of the economic approach to the understanding of the maker culture and movement, highlighting the main economic implications. The economic approach offers a specific analysis framework that allows the understanding of maker culture, as well as its positive and negative effects on the economy and society.

The principles and values that guide the maker culture have a strong relationship with economic principles. The economic approach is based on the idea that the production and distribution of goods and services are fundamental to economic and social well-being. In this sense, maker culture is a practical expression of this approach, as it values individual production and personal skill over mass production, expanding the possibility of new business models.

It values the place. In line with the theory of endogenous development, which argues that the sustainable development of a place or region must be created or generated from the inside out, from the forces of entrepreneurial leaders (*makers*) who excel in the process of generating knowledge and products that revolutionize the culture and the way of producing, leading to economic and social gains for the local and regional community.

Maker culture is also an important source of innovation, since makers usually use cutting-edge technologies to create new products and services. In addition, the *maker* movement can be seen

as a form of entrepreneurship, as the creation of new products can generate new businesses and jobs. In this sense, maker culture can be seen as an important source of technological and economic development.

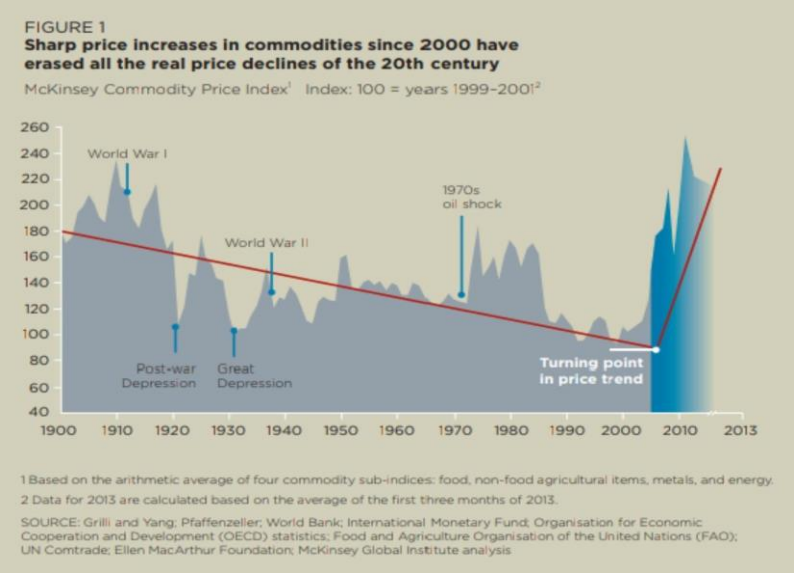
However, the expansion of maker culture can be hampered by an important factor: the lack of financial investment. Many makers do not have enough resources to finance their projects, which can limit their growth potential. Hence the importance of the knowledge of the Theory of Social Capital, which emphasizes the union of agents or people of a given institution or community to achieve objectives that they could not achieve alone (MOREIRA, 2007). The cost-effective approach can help identify the main financial obstacles that *makers* face and suggest alternatives to overcome them.

THE LINEAR ECONOMY, THE CIRCULAR ECONOMY, AND THE CHALLENGES IN THE TRANSITION FROM THE LINEAR MODEL TO THE CIRCULAR MODEL OF PRODUCTION

Since the Industrial Revolution in the eighteenth century, the established economic system has been anchored in the linearity of production, that is, it follows the model of extract-produce-discard. However, the finite condition of mineral and energy resources, indispensable for the success of this process, increases the pressures on global supply chains, creating distortions in *commodity* markets and raising their prices, as can be seen in Figure 1.

In addition, the process of disposing of products causes the accumulation of waste, which ends up resulting in energy inefficiency, since their residual energy is discarded, resulting in losses in the stages of the production life cycles.

Figure 1 - Commodity Price Index between 1900-2013



Fonte: FOUNDATION, 2014, p. 13.

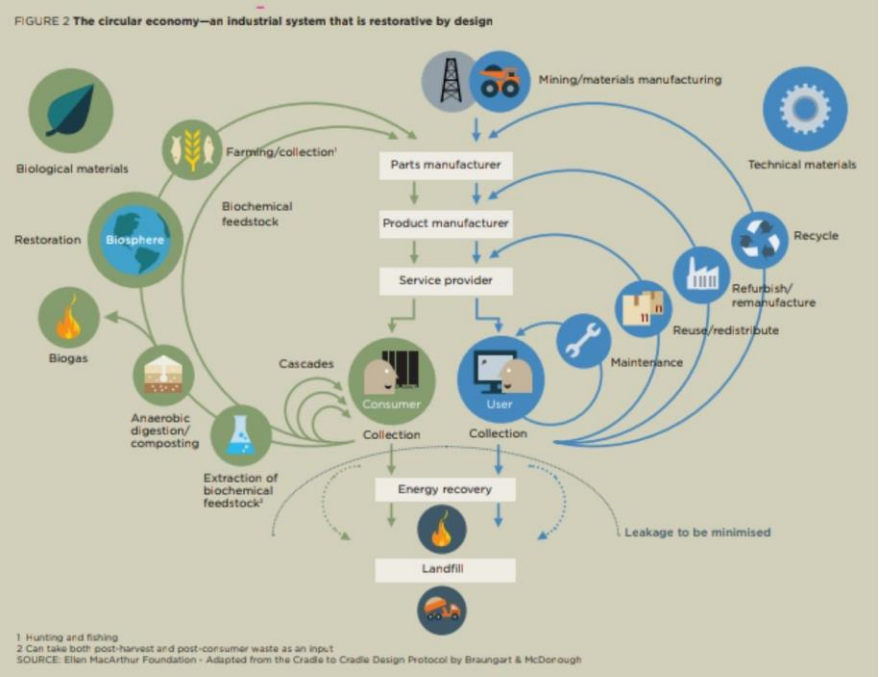
In addition to the issues involving linearity in relation to the non-use of inputs in their fullness, the model requires mass consumption to remain operational, leading to the creation of products with dubious quality to provide the need to change them constantly. In technical terms, this characteristic is called planned obsolescence, that is, the process in which goods are produced with a pre-defined expiration date so that the plaintiffs are always observing the need to exchange them.

The mere notion that products do not have a long shelf life already increases the desire to consume new, more advanced and special. In a culture of: broke, thrown away, buy a new one - without reuse, repair and/or circularity. The origins of planned obsolescence have their roots in the formation of business cartels, such as Phoebus, formed in 1924 in the city of Geneva, to debate the conditions of light bulbs and reduce the useful life from 2,500 to 1,000 hours. Since then, corporations have applied the same logic to encourage the accelerated disposal and consumption of their products (FOUNDATION, 2015).

Regarding externalities, mainly related to the incorrect disposal of chemical inputs used in the production process, which harm the air, soil and the water network of entire regions, they are deeply associated with the linear production model, with serious consequences for the population, increasing the risk of lung diseases, cancers and contamination by neurotoxic agents. Greenhouse gases, for example, are related to climate change and the growth of environmental disasters at various levels. It is pertinent to point out that, according to the concept of scientific racism, the people who are most vulnerable to the negative externalities of production are those who have little income to protect themselves, including living in peripheral spaces and belonging to ethnic groups disadvantaged by the structure present in society (FOUNDATION, 2014).

The circular economy, on the other hand, is an economic concept developed under the aegis of long-term sustainable growth, replacing the problematic linear production model, whose structure has proven to be unsustainable and generates negative externalities that compromise the well-being of society. The circular production process is fundamentally concerned with not only extracting the value of natural capital, but also regenerating it within a cycle, either in the production chain itself or in different industries, as can be seen in Figure 2.

Figure 2 – Industrial cycle expressed in the Circular Economy



Fonte: FOUNDATION, 2013, p. 29.

Thus, the scarcity of natural and energy resources is understood, and that these must be used effectively and efficiently within new business models allied to technologies and restorative processes (GONÇALVES; BARROSO, 2019).

In its structure, the circular economy works with the possibility of *upcycling*, that is, the process of transforming solid waste, useless materials, and discarded objects into goods destined for some new use, whether in a domestic or industrial reproduction process. This technique, however, has particularities that go beyond traditional recycling, as it is not based on the shredding and/or total breakdown of the original material, but rather on maintaining the integrity of the component, resignifying it with occasional updates for new functions (FOUNDATION, 2017).

In organizational terms, the practical transition to a circular economy depends on social and environmental responsibility in the culture of families, companies and, certainly, governments, starting from domestic recycling to the sharing of resources and the implementation of a clean energy matrix that puts renewable options first.

Therefore, the circular model is closely linked to the low-carbon economy that has been advocated by international organizations and entities, such as the United Nations and the European Union. It is worth mentioning that, within its specificities, the assumptions of a commercial society shaped by a circular economy go beyond recycling and reuse and undergo profound changes in the behavior of suppliers and demanders, with a greater focus on the performance of goods and services available in different markets, including a maker culture, of making and creating technological and technical solutions to meet local or/and regional demands. This perspective goes against planned obsolescence.

The challenges surrounding the productive and energy transition to a low-carbon economy are closely connected with the circular economy. However, the magnitude required in this scenario for such profound modifications is unprecedented in history.

> In a world approaching 9 billion people by 2030, including 3 billion new middle-class consumers, the challenge of expanding supply to meet future demand is unprecedented (World Economic Forum, 2014).

A MAKER CULTURE

In the post-World War II period, with the need for labor, scarce resources and the genuine desire for reconstruction, a new concept emerged in the United States of America (USA) and Europe, called "Do It Yourself" (DIY), which culminated in the mainstay of the maker movement. This concept was consistent with the period of uncertainty, due to the destruction caused by the fighting of 1939-1945 and, essentially, the decrease in civilian production in this period.

After 1945, with productive arrangements slowly being reallocated to the production of goods and services and a surplus of military goods, especially in the United States, individuals began to use their creative capacity to build, alter, and restore objects, adding greater value and utility to meet certain needs (PIRES, 2022).

Maker culture has effects on the economy and society. Kumar (2006, p. 50-51) clarifies the following:

> Knowledge not only determines, to an unprecedented degree, technical innovation and economic growth, but is fast becoming the key activity of the economy and the main determinant of occupational change [...] The information society, according to its theorists, generates changes at the most fundamental level of society. A new mode of production begins. It changes the very source of wealth creation and the determining factors of production. Labor and capital, the basic variables of industrial society, are replaced by information and knowledge.

The principles of maker culture, which emphasizes creation and innovation, can be related to the concept of scalability in the economy. Scalability refers to the ability to expand a business model or an idea efficiently and effectively. At school, this scalability contributes to the intellectual development of students. Like so:

> The traditional approach is still quite common in schools in Brazil, so maker activities, based on the constructionist approach, have become a strong trend, and can be seen as a new way of working with technology in school, as it provides practical learning, prioritizing creativity and problem solving. (AZEVEDO, 2019, p. 66).

It can be seen that the maker culture promotes collaboration and knowledge sharing among its members.

According to Anderson (2012), *Makers: The New Industrial Revolution*, this collaboration is essential for the dissemination of innovative ideas and solutions. When knowledge is shared, the barriers to innovation are reduced, which contributes to the scalability of the economy, since ideas can be widely adopted and improved.

The ability to create prototypes quickly is one of the pillars of maker culture. According to Gershenfeld (2005), in "FAB: The Coming Revolution on Your Desktop", rapid prototyping allows ideas to be tested and refined in an agile way. This is critical for scalability, as it allows innovations to be perfected before they are implemented on a large scale.

> Analyzing the new possibilities of using the maker culture, it could be seen that when we started the procedure of detachment from the traditional teaching model and started to produce knowledge through the use of the maker culture. (AZEVEDO 2019, p. 67).

The maker culture values the customization of products and solutions. The ability to adapt products to individual needs is essential for scalability in the economy, since solutions can be targeted at different market segments. This democratization of technology contributes to scalability, since more people can participate in creation and innovation.

While the concept of "Do It Yourself" was not entirely new or inherent in these historical conditions, it is true that throughout human development, creativity has always played an essential role in invention and craftsmanship. However, it is at this moment that the objective of reducing individuality, reusing materials and establishing new paradigms in the dissemination of knowledge in a community format advances and finds new possibilities.

However, in the post-war decades of the 50s and 60s, although they are seen as the fertilization phase of what would become the maker culture and education present in the daily life of the twenty-first century, it is essential to realize that the feverish dissemination of this movement occurred with the production of the first personal computers in the 70s and 80s.

The maker movement, whose name derives from the English verb *to make* , is the massification of "Do It Yourself", imbued with a systematic practice of construction, modification and restoration of objects, often creating new concepts, through spaces where collectivity and the sharing of information and tools are indispensable, in a practice in which individualism loses space for the improvement of production to be maximized. In addition, the "being *maker*" carries in its philosophy the protagonism in the mode of creation, from the formulation of the concept to the application of the "Hands On", a change of scheme that goes on a collision course with the massive production process present in industries, of which the subject is only a component in the gigantic machinery of production, without mastering all the knowledge of the process.

Thus, immersed in the notion of collectivity, Maker Spaces or FabLabs emerge, places prepared for "hands-on" practices, with equipment and tools that seek to help in the creative process

and, necessarily, in the application of this creativity in resignifications that will solve real problems. Such spaces are generative sources of teaching and learning, including people of various ages and different knowledge, but who, following common desires and niches, are able to work in cooperation and establish a true *maker culture.*

Likewise, schools are key players in the dissemination and impacts that the *maker* movement is capable of conceiving. Since in its most elucidative characteristics is the use of modern technological resources. These resources are increasingly common in the reality of children, adolescents and young people, due to the almost universalization of such electronic technologies and the internet in the daily lives of families, making them grow in a true digital nativity.

Traditional teaching, therefore, begins to present incompatibility with the reality in which it is established, requiring new approaches that place students at the center of their own learning. Maker education, in this sense, sows vast opportunities for experimentation, discoveries, mistakes and the achievement of innovative solutions in the classroom, integrating *maker* activities with the syllabus.

Currently, a huge number of supporters are joining the *maker* culture and placing the movement as one of the most prominent innovation hubs of the 21st century, especially with the organization of mechanisms for the dissemination of works and perspectives on the area. The creation of Make Magazine, by Dale Dougherty, in 2005, with an emphasis on step-by-step projects, symbolized the imminence of an increasingly professional and systematized maker movement, whose members are collaborating to form a worldwide network of connections in maker fairs, adding to the movement traces of entrepreneurship and new personalized business niches, replacing mass products and, therefore, standardized (STURMER; MAURICIO, 2021).

Furthermore, the academic interest in relation to the "Do It Yourself" lifestyle has gained momentum with the panorama of *maker education*, with pedagogues, andragogues and other professionals interested in the teaching area willing to carry out more research *in loco*, to understand the consequences of this active methodology. In political and governmental terms, the maker movement appears as an ally in the fight against climate change, encouraged, in particular, in the European Union and in NGOs around the world. In the United States, for example, former President Barack Obama established the National Day of Making National Maker Day, celebrated every June 17 (PAULA; MARTINS; OLIVEIRA, 2021).

The consolidation of *maker* thinking and its satellite communities, such as FabLabs and makerspaces, can contribute significantly to promoting habits and conditions that align with the circular production system. This, in turn, holds positions complementary to the *maker culture*. Therefore, it is up to political and economic agents to perceive such synergies and establish the necessary incentives for the "symbiosis" of both movements (SILVA; SOUZA; TEIXEIRA, 2019).

Although the *maker* movement and the circular economy have distinct conceptual frameworks, as well as particular histories and ultimate purposes, the characteristics that govern both are glimpsed from the panorama of sustainability, collaboration, and the development of new processes and technologies to streamline the way in which waste apparently useless for its original uses is reintroduced into society. In addition, both approaches applied together are able to accelerate the entrepreneurship process, with business projects being born based on the technique of upcycling and reuse of discarded materials, generating products with a longer useful life.

Thus, it is inferred that the circular economy has a growing role in the world in terms of changes in production and consumption habits and behaviors, taking the lead in the ability to shape the thinking of communities and populations willing to see in the economic process more than the harmful linearity. In other words, for companies, especially manufacturing industries, to transition from an economy based exclusively on harmful extractivism, it is essential that the mentality of society as a whole evolves towards the paradigm of circularity. Whether in schools or in social projects, the *maker movement* carries with it this willingness to be inductive in the process.

Kumar (2006, p. 56) considers that the "information society will be revolutionary". It can be said, currently, that the *maker* movement will be a revolutionary culture, a lifestyle, which will help humanity to deal with the imbalances in the social and productive areas, if the institutional agents collaborate for the communication and financing of the *maker* movement. It is not a fad, but a necessity, which can be clearly seen in economic models, government programs and studies on the use, reuse, exploitation and scarcity of natural resources.

Today, as in the industrial and post-industrial period, there are contradictions, at the same time that there is standardization in the way of consuming and being, there is also a movement towards being, creating individually or with few employees, producing flexibly and personifying consumer demand. Kumar (2006, p. 89) presents that "the revival of artisanal skills, a class of service not necessarily linked to capitalism and willing to contest it on certain points, but these, is the most notable aspect of which is the domination exercised by transnational corporations, of unprecedented wealth and power".

In the economy, the global market is global companies, with powerful leaders, who make money flow from market to market, according to the expected returns. There is also a flexibilization of production, dispersion and decentralization, replacement of marketing and mass production; there is a movement of more leveled hierarchies and emphasis on communication, an increase in outsourcing, franchising and marketing between companies, an increase in flexible time workers, and now, after the Covid 19 pandemic, in an increase in companies and workers who adopt remote work (*home-office*), extinction of functions in public and private companies, increase in people who seek

entrepreneurship as a strategy for insertion in the market and self-employed people who work from home.

Thus, the *maker* movement is a space to create and co-create, in an *interpreneutral* movement of entrepreneurship, emerging *startups* and promises of wealth, with the implementation of solutions and products and processes that respond to market opportunities and families.

According to Kumar (2006, p. 61) there are changes, such as the "development of individualistic ways of thinking and behavior; the culture of free enterprise, the end of universalism and the standardization of education... fragmentation and pluralism in values and lifestyles". If, on the one hand, man stepped on the moon, on the other hand, man was unable to live together and establish a peaceful, just and environmentally sustainable society, and to develop spiritually, developing virtues and practical principles of cooperation, collaboration and sustainability. The maker culture has this spirit of doing and being a sustainable, supportive, cooperative, collaborative movement and at the same time it values initiative and personal creation.

ECONOMIC THEORIES RELATED TO *MAKER PRODUCTION*

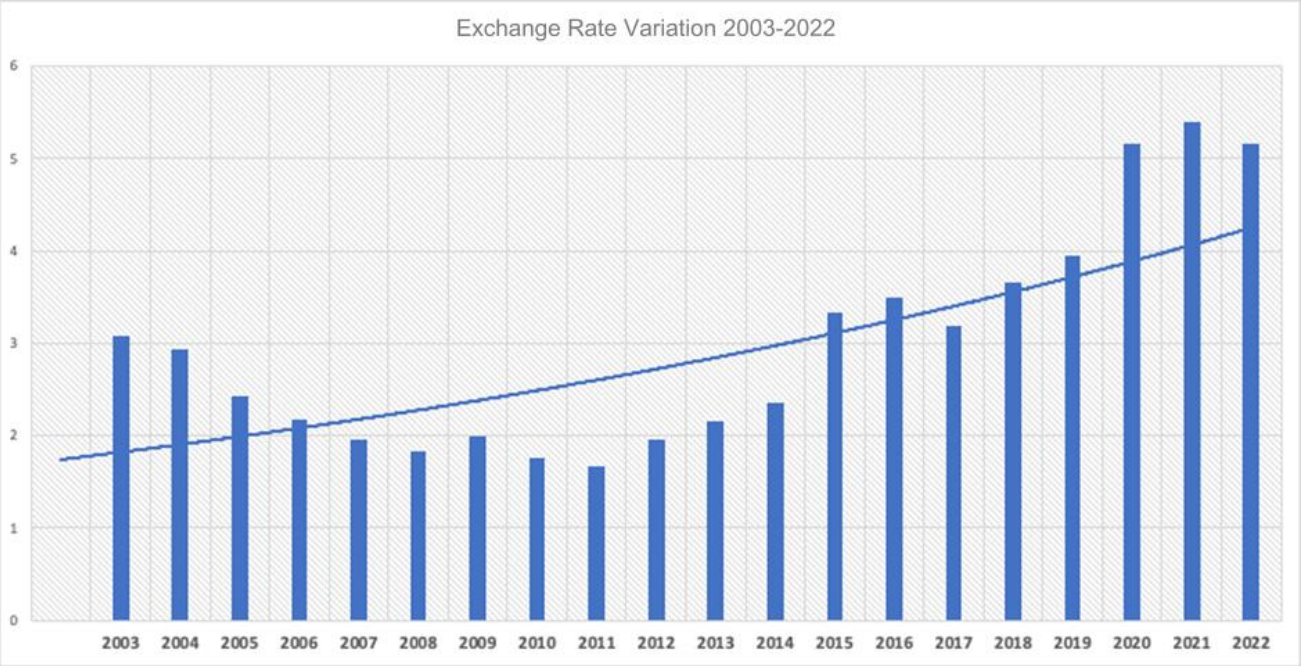
There are some economic theories that can be related to *maker production*. Among them, the most directly related ones will be displayed in the next subsections.

THEORY OF ECONOMICS OF PRODUCTION COSTS

Proposed by Ronald Coase, this theory suggests that the existence of transaction costs can lead to the creation of organizations that produce in-house, rather than buying products on the market. In *the maker* culture, transaction costs are reduced, since it is possible to produce items autonomously, without depending on third parties (NELSEN, 2016).

The chart below shows the exchange rate variation of the real (R$), in relation to the dollar (U$$) sale. When the exchange rate is valued, it means that external prices have decreased, because fewer dollars will be needed to acquire a certain commodity. The trend line shows a favorable scenario for imports, including inputs for industry and electrical and electronic products. See the following graphic:

Chart 1 – Exchange rate change 2003-2022



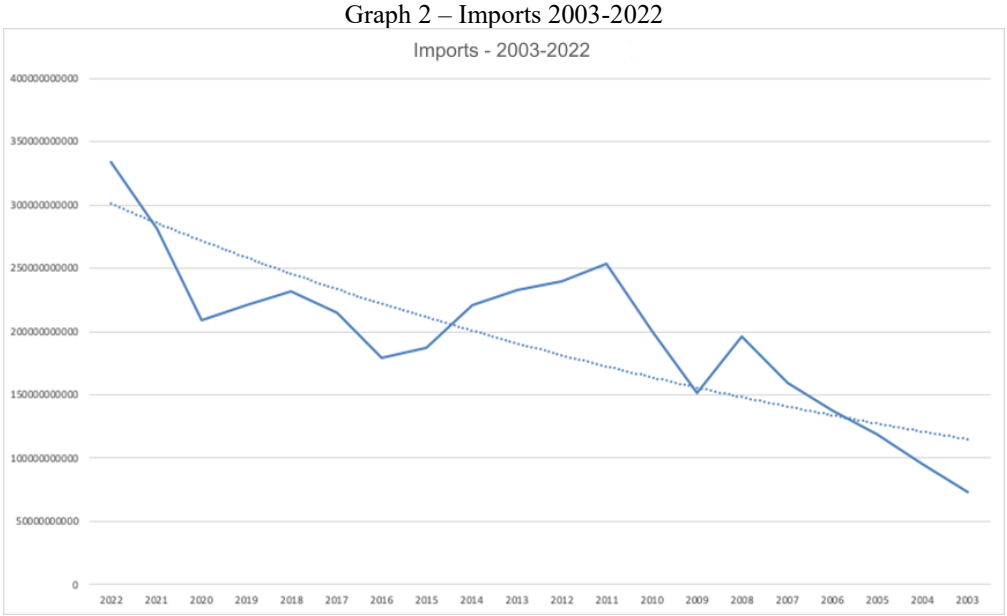
Source: Adapted from IPEADATA, 2023.

It is worth remembering that:

> 'Exchange rate is the price of a foreign currency measured in units or fractions (cents) of the national currency. In this case, the foreign currency is the dollar. The average rates are calculated for buying and selling and use the daily quotations of the reference period to perform the calculation, in this case, the year. The daily rate used for such calculation is called PTAX. In this case, it is the sales fee' (IPEADATA, 2023).

See also the next graph:

Graph 2 – Imports 2003-2022



Source: COMEXSTAT/MDIC, 2023.

According to Peremuter (2019, p. 278):

> With the drop in the prices of both printers and the inputs that are used to produce the objects, the scenario in which the user will be able to design, customize, choose the materials, size and colors of their next shoe (or bag, or shirt, or coat) seems to be close.

The top 10 products imported by Brazil in 2021 are shown in the table below:

Table 01 – Products imported by Brazil in 2021

	Product	**Good phob us$**
First	Fertilizers or fertilizers	13.4 billion
2nd	Fuel oils from petroleum or bituminous minerals	12.1 billion
Third	*Other Products - Manufacturing Industry*	8.9 billion
4th	Medicines and pharmaceutical products, other than veterinary	7.3 billion
5th	Thermionic valves and tubes	7.1 billion
6th	*Telecommunication Equipment*	7.0 billion
7th	Parts and accessories of motor vehicles	6.7 billion
8th	Organ-inorganic compounds	5.9 billion
9th	Natural gas, liquefied	3.9 billion
10th	*Non-electric motors and machines*	3.8 billion

Source: FAZCOMEX, 2023.

Now, the analysis of another economic theory follows.

OPEN INNOVATION THEORY

Developed by Henry Chesbrough, this theory suggests that in the age of knowledge, companies need to open up to external collaboration in order to accelerate innovation. In *maker* culture, techniques and tools are often shared openly, which allows for the creation of new products and solutions more quickly. Kumar (2006, p. 53) states that "networks restructure the power and the flow of communication within the company, from vertical to horizontal [...]. The computer will destroy the pyramid."

According to Anderson (2012), maker culture promotes creation, innovation and problem solving through manufacturing and creative thinking. This author emphasizes how this culture encourages entrepreneurship, as it empowers individuals to turn their ideas into reality and create innovative products or solutions.

Authors such as Osterwalder and Pigneur (2010) highlight the importance of creating business models that are scalable, but also adaptable to customer needs. This approach aligns with valuing personalization in maker culture, which can be incorporated into startup business models.

According to Christensen (2011), the empowerment of the individual plays a fundamental role in innovation. Maker culture and entrepreneurship empower individuals to innovate and create solutions to problems, often starting on a small scale, similar to the concept of "disruptive

innovation." According to Blank and Dorf (2012), building an entrepreneurial ecosystem that supports the growth of startups is crucial. This ecosystem often includes makerspaces and maker communities, where collaboration, knowledge sharing, and innovation take place at scale.

According to Ries (2011), startups are companies that often arise from innovative ideas and have the agility to grow quickly. This author highlights the importance of continuous innovation and agile learning for the success of a startup. This aligns with the experimental and iterative approach of *maker culture*.

According to the list of the fourth edition of *rankingporvir.org*, a project of the Inspirare Institute, which had the participation of 1,591 companies, the ten *startups* that stood out the most in the area of education in 2019 were the following:

Table 2 – Inspirare Project Ranking

EDTECH (*Startups* in the area of education)	**Activity**	**Origin**
1. **Dschool**	Online innovation school that helps large companies in the era of digital transformation with training for new skills.	São Paulo
2. **Happmobi**	We develop solutions for distance education with data mapping to identify technical gaps.	São Paulo
3. **Startup Mundi**	Gaming experience to accelerate open innovation and entrepreneurial education.	São Paulo
4. **Blox**	Curriculum management educational system designed for high school institutions, higher education institutions and corporate universities.	São Paulo
5. **Mastertech**	Training in large-scale digital skills: programming, digital business, digital marketing, data science and UX design.	São Paulo
6. **Keeps Active Learn**	Artificial intelligence-guided learning platform, which enhances the user experience with a high level of sharing, personalization, and engagement.	Santa Catarina
7. **Escribo Innovation for Learning**	Escribo equips teachers so that their students can achieve learning standards and become proficient in digital literacy skills.	Pernambuco
8. **Engage**	Gamified learning platform that increases employee participation in training by 4x.	São Paulo
9. **Kriativar**	It promotes changes in education and business processes through technologies such as artificial intelligence, augmented reality, and virtual reality.	Minas Gerais
10. **Oops Education**	Cell phone application for school attendance control.	Rio de Janeiro

Source: PORVIR, 2023.

It is noticed that there is a concentration of startups in the State of São Paulo, 60% of startups. The Northeast has only one startup, which demonstrates that investments and entrepreneurial ecosystem are more favorable in the Southeast and South regions of Brazil.

SHARING ECONOMY THEORY

This theory proposes a paradigm shift in which users become the producers of goods and services, rather than passive consumers. In maker culture, this idea is put into practice, since people can create products with their own hands and share them with the community.

The sharing of information has effects on several markets, as Kumar (2006, p. 47) says: "the exchange of information around the world between scholars and specialists is also rapidly becoming a reality". The catalogs of large libraries and archives can be consulted from a number of different locations with the aid of a computer terminal. Much of the material stored in these libraries can also be read on site in the form of microfilms or microfiche.

The world's major electronically linked stock markets make instant adjustments to stock prices in response to information transmitted by computer screens. The purchase and sale of shares during the 24 hours of the day becomes, for the first time, a possibility and, increasingly, the practice".

THEORY OF SOCIAL CAPITAL

Having Pierre Bourdieu and James S. Coleman as precursors, it deals with the value that social relations have in the creation of economic value. According to this theory, networks of relationships and social norms are fundamental for the creation of trust, reciprocity, and cooperation, which are essential for the functioning of an economy. Social capital can be seen as a collective asset that is built and maintained through participation in organizations and social interaction. Social capital can be harnessed to generate economic benefits, such as access to resources, information, and business opportunities. Maker production can be seen as a form of social capital construction, since collaboration between members of the *maker community* is an essential aspect of this movement (MOREIRA, 2007).

These theories demonstrate that *maker culture* has profound implications for the economy and the way companies and individuals produce and consume goods and services. In part, the maker movement is well articulated and intertwined with the principles of cooperative economy.

Cooperative economics is a form of economic organization in which groups of individuals voluntarily come together to create a democratic enterprise, where decisions are made equally among its members and financial results are divided fairly among the participants, according to their

production and participation in society. In *maker* culture, this approach can be seen as a form of collaboration and teamwork, with individuals sharing knowledge and skills to build joint projects.

The *maker movement* values the autonomous production of objects and the exchange of knowledge in communities of practice, which is why we work a lot in networks and in cooperative and collaborative movements. This approach can be compatible with the cooperative economy, since it allows the creation of groups of people who share resources, knowledge, and the production of goods in a collaborative and egalitarian perspective.

Thus, the cooperative economy can be an interesting way to apply the *maker culture* in the economy, favoring the sharing of knowledge and resources, in addition to stimulating the formation of communities focused on innovative and participatory projects.

CONCLUSION

We conclude that the economic approach is a valuable tool for analyzing maker culture. Through it, we can understand the main characteristics of this movement and the implications for the economy and society as a whole. The *maker* culture can be seen as an important stimulus for entrepreneurship and innovation, in addition to representing a significant potential generator of jobs and income.

The *maker* culture tends to consolidate, since companies are in a more flexible production process. The use, reuse and rational use of natural resources requires new production processes, based on new technologies and the creativity of the makers or makeans.

However, the lack of financial investment can be a significant obstacle to the growth of *maker culture*, which underscores the need for public policies that encourage the expansion of this movement.

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Management of hemorrhagic stroke: A literature review

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Víctor César Vieira de Oliveira Barros[1] and Aline Reis Domingues[2]

ABSTRACT

Hemorrhagic stroke is a serious neurological emergency that represents a significant cause of global morbidity and mortality. Characterized by bleeding in the brain, stroke requires an urgent and well-coordinated management approach to minimize brain damage and improve patient outcomes. This literature review aims to provide a comprehensive analysis of current approaches to stroke management, including recent advances, persistent challenges, and prospects. The review was based on articles selected from the PubMed, Scopus and Google Scholar databases, using specific search terms. The analysis covered emergency interventions, rehabilitation strategies, and post-acute care, with an emphasis on diagnostic, therapeutic, and complication prevention protocols. The findings highlight the importance of early identification of symptoms, effective surgical interventions, strict control of intracranial pressure, and prevention of secondary complications. Recent advances in technology and research are discussed, highlighting their impact on therapeutic strategies. Although there have been significant improvements in stroke management, challenges persist and require a multidisciplinary approach and continuous development of new strategies.

Keywords: Hemorrhagic Stroke, Acute Management, Rehabilitation, Surgical Intervention, Prevention of Complications.

[1] Graduated in Medicine
Federal University of Ceará (UFC)
[2] Graduated in Medicine
Faculty of Health and Human Ecology (FASEH)

INTRODUCTION

Hemorrhagic stroke (CVA) occurs when there is bleeding inside the brain, resulting in increased intracranial pressure and neuronal damage. It accounts for approximately 10-15% of all stroke cases, but is associated with higher mortality compared to ischemic stroke (1). Stroke is mainly divided into intracerebral hematoma (ICH) and subarachnoid bleeding (SA). Both have distinct characteristics and management approaches (2).

METHODOLOGY

To conduct a comprehensive review on stroke management, the following methodological steps were followed:

1. **Database Selection:** We used the PubMed, Scopus and Google Scholar databases to collect relevant articles.
2. **Inclusion Criteria:** Systematic review studies, clinical trials, and guidelines from the last two decades on acute management, surgical interventions, rehabilitation strategies, and prevention of complications were included.
3. **Search Terms:** The search terms used were "hemorrhagic stroke", "acute management of stroke", "surgical intervention in stroke", "post-stroke rehabilitation", "prevention of complications".
4. **Article Analysis:** Articles were analyzed for relevance, methodological quality, and impact on stroke management guidelines. The analysis was divided into main categories: diagnosis, surgical interventions, intracranial pressure control, and rehabilitation and complication prevention strategies.

ACUTE MANAGEMENT OF HEMORRHAGIC STROKE

DIAGNOSTIC APPROACHES

Rapid and accurate diagnosis of stroke is crucial for effective management. Computed tomography (CT) is often the first choice due to its rapid availability and ability to identify the presence and extent of bleeding (3). For example, in the study by Kelly et al. (2015), CT was essential to determine the severity of the hematoma and guide the decision for surgical intervention (4). Magnetic resonance imaging (MRI) offers a more detailed view and is useful for evaluating secondary complications, such as posthemorrhagic hydrocephalus (5).

SURGICAL INTERVENTIONS

- **Craniotomy and Hematoma Evacuation:** Craniotomy is often necessary for the removal of large or symptomatic hematomas, especially in cases such as the study by Mendelow et al. (2010), which showed that early evacuation can reduce mortality and improve functional recovery (6). Minimally invasive techniques, such as endoscopic surgery, have also been shown to be effective. In a study conducted by Yoon et al. (2018), endoscopy allowed for hematoma evacuation with a lower risk of complications and reduced recovery time (7).
- **Ventricular Drainage:** External ventricular drainage (EVD) is used to control intracranial pressure in patients with hydrocephalus. The study by Anderson et al. (2014) demonstrated that EVD can be effective in preventing serious complications associated with increased intracranial pressure (8). This approach is especially important in cases where hydrocephalus is a common complication of stroke.

BLOOD PRESSURE CONTROL

Keeping blood pressure under control is essential to prevent bleeding progression and reduce intracranial pressure. Current guidelines recommend maintaining systolic blood pressure below 140 mmHg for stroke patients (9). In the study by Morita et al. (2008), strict blood pressure control was associated with better clinical outcomes and a lower rate of secondary complications (10). Strategies include the use of intravenous antihypertensive agents and continuous monitoring.

PREVENTION OF COMPLICATIONS

Prevention of secondary complications, such as infections and hydrocephalus, is crucial for stroke management. The use of prophylactic antibiotics, as indicated by Duncan et al. (2005), helps reduce the risk of postoperative infections (11). Close monitoring to detect hydrocephalus and early treatment are key to preventing further damage to the brain (12). For example, in a study by Williams et al. (2020), early intervention to treat hydrocephalus was associated with better functional recovery (13).

REHABILITATION AND POST-ACUTE CARE

REHABILITATION STRATEGIES

Rehabilitation should begin as soon as the patient is stable. A multidisciplinary approach is key, involving physical therapy, occupational therapy, and speech therapy. The study by Langhorne et al. (2009) showed that physical therapy aids in the recovery of motor function and mobility, while occupational therapy and speech therapy are important for improving the ability to perform daily

activities and treating communication difficulties (14). Personalized rehabilitation programs, as demonstrated in the study by Winstein et al. (2016), have shown significant results in improving the quality of life and functionality of patients (15).

LONG-TERM CARE

Long-term management involves continuous monitoring and family support. Family participation and community support are vital for the patient's reintegration into daily life. Studies such as the one by Kwakkel et al. (2013) highlight the importance of prolonged rehabilitation and continuous support to achieve the best possible recovery (16). Comprehensive care plans, including community resources, help improve patient outcomes and quality of life.

RECENT ADVANCES AND FUTURE PROSPECTS

TECHNOLOGICAL INNOVATIONS

Advances in imaging technologies, such as high-resolution CT and MRI, have improved diagnostic accuracy and treatment planning. The study by Yang et al. (2019) showed that minimally invasive techniques, such as endoscopic surgery, result in fewer complications and faster recovery (17). These innovations are transforming stroke management and providing better outcomes for patients.

GENETIC RESEARCH AND BIOMARKERS

Research on genetic factors and biomarkers is offering new insights into individual risk profiles and potential therapeutic targets. The study by Ma et al. (2021) highlights how the identification of genetic predispositions and the use of biomarkers can lead to more personalized and effective treatment strategies (18). Additional studies are needed to validate these findings and integrate them into clinical practice.

DISCUSSION

Stroke management has advanced significantly with improvements in surgical techniques, imaging technologies, and rehabilitation approaches. However, there are still challenges, such as variability in patient response and the occurrence of secondary complications. A multidisciplinary approach is essential to address these challenges and optimize treatment strategies. The integration of technological innovations and scientific advances offers new opportunities to improve stroke management and patient outcomes (19, 20).

CONCLUSION

Although there have been substantial advances in stroke management, challenges persist and require a coordinated, multidisciplinary approach. The continuous development of new strategies and the integration of technological innovations are essential to address the challenges associated with stroke and improve the quality of life of patients.

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Bacterial meningitis secondary to otomastoiditis by Providencia Rettgeri in private of liberty

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Cezar Arruda de Oliveira Filho[1], Isabela Pimenta Pelucio[2], Carolina Bertini Bonini[3], Akissy Aline Uchiuama Nomura[4], Ana Julia Fonseca Arruda de Oliveira[5], Eduardo Vilela de Andrade[6], Lázaro Leonardo Mendes de Oliveira[7], Felipe Garcia Pereira[8] and Philippe de Figueiredo Braga Colares[9]

ABSTRACT

Introduction: This case report describes a rare occurrence of meningitis caused by Providencia rettgeri in an inmate patient. Providencia rettgeri is a gram-negative bacterium that rarely causes meningitis, and is most commonly associated with urinary tract infections and septicemia in immunocompromised patients. (1)
Case Presentation: Man, 29 years old, deprived of liberty, without comorbidities. Onset of otalgia, fever and otorrhea for 21 days, with previous use of Ceftriaxone + Oxacillin, without improvement. Admitted due to prostration for 02 days, mental confusion and lowering of the level of consciousness. Physical examination showed neck stiffness, ECG 9, left otoscopy with purulent secretion and opaque tympanic membrane with central perforation of 10%. A CT scan suggestive of otomastoiditis was performed. In addition to the area of bone erosion in the posteromedial aspect of the ipsilateral mastoid, with communication with the cerebellar hemisphere determining peripheral edema. The cerebrospinal fluid was collected, antibiotic therapy for vancomycin + meropenem was scheduled, corticosteroid therapy was initiated, and the patient was referred for simple mastoidectomy on the left. It has been identified in the growth abscess culture of Providencia Rettgeri. Discussed with CCIH, we opted for maintenance of antibiotic therapy due to the patient's clinical severity and weekly cerebrospinal fluid control was suggested to determine the duration of treatment. After 28 days of treatment, the patient progressed with improvement in the CSF pattern, but developed bicytopenia. After 3 days of the end of treatment, the blood count showed improvement, the patient did not present motor or neurological sequelae, and was discharged from the hospital with outpatient follow-up.
Comments: Providencia spp. is a genus composed of five species. In the clinical setting, P. stuartii is most commonly seen in patients. Most strains of P. rettgeri exhibit pathogenic properties similar to those of P. stuartii. In a literature review, there is a lack of data on CNS infection in humans by the species P. rettgeri (2). Deprived of liberty are often exposed to unhealthy environments that can predispose to the risk of contamination by atypical pathogens. We reinforce the importance of collecting cultures to increase our knowledge about these pathogens in this population and their resistance profiles, in order to optimize the conducts in the face of atypical cases such as the one reported. (3)

[1] Academic institution:Faculty of Medicine of São José do Rio Preto (FAMERP),
Highest Education Degree: Medical Graduate
E-mail: cezar.a.filho1997@gmail.com
[2] Highest degree of education: Graduated in Medicine.
Academic institution: FAMERP
[3] Highest degree of education: Graduated in Medicine.
Academic institution: FAMERP
[4] Highest Education Degree: Medical Graduate
Academic institution: FAMERP
[5] Highest degree: Medical Graduate
Academic institution: Faculty of Medicine of Taubaté
[6] Highest degree of education: FAMERP
Academic institution: Graduated in Medicine.
[7] Highest degree of education: FAMERP
Academic institution: Medical Graduate
[8] Highest degree of education: FAMERP
Academic institution: Graduated in Medicine.
[9] Highest degree: Pulmonologist, PhD student in Pulmonology.
Academic institution: University of São Paulo

Conclusion: This case highlights the importance of considering Providencia rettgeri as a potential pathogen in cases of meningitis, especially in at-risk populations such as inmates, opening the horizon for at-risk populations for this infection. Early identification and appropriate treatment are crucial for a favorable outcome, in addition to the need for further studies on the bacteria.

Keywords: Providencia Rettgeri, Central nervous system infection, Deprived of liberty.

INTRODUCTION

Meningitis caused by *Providencia rettgeri* is an extremely rare condition, with few cases reported in the medical literature. *Providencia rettgeri* is a Gram-negative bacterium most commonly associated with urinary tract infections and septicemia in immunocompromised patients, and is an atypical occurrence in cases of meningitis .However, in prison settings, factors such as overcrowding, poor hygienic conditions, and limited access to medical care can increase the incidence of rare pathogen infections. (4)

In prison settings, the epidemiology of meningitis is influenced by conditions that favor the transmission of infectious agents. Overcrowding facilitates the spread of pathogens, while inadequate hygiene increases the vulnerability of inmates to infections. A systematic study highlighted that the incidence of infectious diseases, including meningitis, is significantly higher in prison populations compared to the general population, due to the combination of environmental and behavioral factors (3)

In addition, the prevalence of comorbidities, such as immunosuppression due to drug use or chronic diseases, contributes to greater susceptibility to severe infections among prisoners. This is especially relevant in cases of bacterial meningitis, where the host's immune response is crucial for infection control. Studies show that interventions aimed at improving the health of inmates during and after incarceration can reduce the incidence of serious infections, including meningitis. (5)

Therefore, the occurrence of Providencia rettgeri meningitis in an inmate patient not only underlines the need for strict epidemiological surveillance, but also emphasizes the importance of improving health and hygiene conditions in prison systems. This case report contributes to the understanding of the epidemiology and management of rare infections in prison environments, in addition to elucidating the diagnosis and treatment, through a case report, of an atypical germ causing meningitis. (6)

CLINICAL CASE

Man, 29 years old, deprived of liberty, without comorbidities. Onset of otalgia, fever and otorrhea for 21 days, with previous use, 5 days before hospitalization, of Ceftriaxone + Oxacillin, without improvement. The penitentiary's health team reports that due to a 2-hour condition presenting a lowering of the patient's level of consciousness, he was brought to a reference service. Admitted to emergencies with a report of prostration for 02 days, mental confusion and pain in the nape of the neck. Physical examination showed neck stiffness, 9-point Glasgow Coma Scale, left otoscopy with purulent secretion, and opaque tympanic membrane with 10% central perforation. A CT scan suggestive of otomastoiditis (image 1) (image 2), (image 3), (image 4) was performed. In addition to the area of bone erosion in the posteromedial aspect of the ipsilateral mastoid, with

communication with the cerebellar hemisphere determining peripheral edema. Due to the fact that the patient presented neck stiffness, associated with a clinical lowering suggestive of a metabolic infectious cause, with clinical and imaging examination showing otitis media, complicated for acute otomastoiditis associated with central nervous system invasion, with a possible abscess, the diagnosis of acute otitis media complicated with meningoencephalitis was then hypothesized.

Due to this, it was decided to perform cerebrospinal fluid collection, staggered antibiotic therapy for Vancomycin + Meropenem by an emergency team, and corticosteroid therapy was initiated. Due to the worsening of the lower level of consciousness, he was pursued with the need for orotracheal intubation and sedation, in addition to contacting the hospital's otorhinolaryngology team to evaluate the condition of infection of the nervous system by contiguity, in addition to acute otomastoiditis. In the cerebrospinal fluid test, the patient had 576 leukocytes per mm3 (81% polymorphonucleates), glucose of 5 mg/dl, proteins of 182 mg/dl. Latex for bacteria negative, VDRL negative,

After evaluation by the otorhinolaryngology team, the patient was referred for simple mastoidectomy on the left, local abscess material was collected, and the infected site was cleaned. After the procedure, the patient was referred to the intensive care unit for intensive care and antibiotic therapy

After 2 days of performing a surgical procedure, Providencia Rettgeri growth abscess was identified in culture. The patient was discussed with a local hospital infection control center that opts for antibiotic therapy due to the patient's clinical severity, and weekly cerebrospinal fluid control was suggested to determine the duration of treatment, since the antibiogram showed sensitivity to the antibiotics in use.

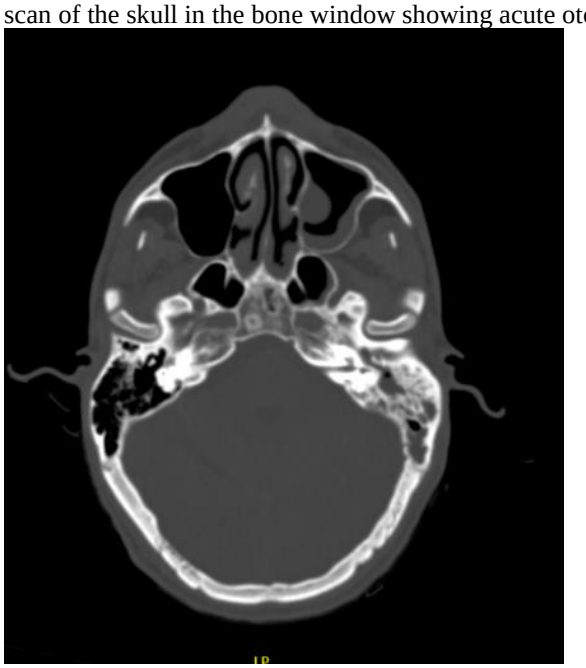
After 5 days in an intensive care unit bed, the patient was extubated, in addition to fully recovering the previous level of consciousness, and was then sent to the ward bed for treatment follow-up, with antibiotic therapy, and weekly cerebrospinal fluid collection. After 28 days of treatment, the patient evolved with improvement in the CSF pattern, improvement in serum and metabolic tests, in addition to complete clinical improvement, and was discharged from the prison system.

Image 1 – CT scan of the skull in a bone window showing acute otomastoiditis, with erosion of the floor that separates the mastoid from the brain, observing continuity



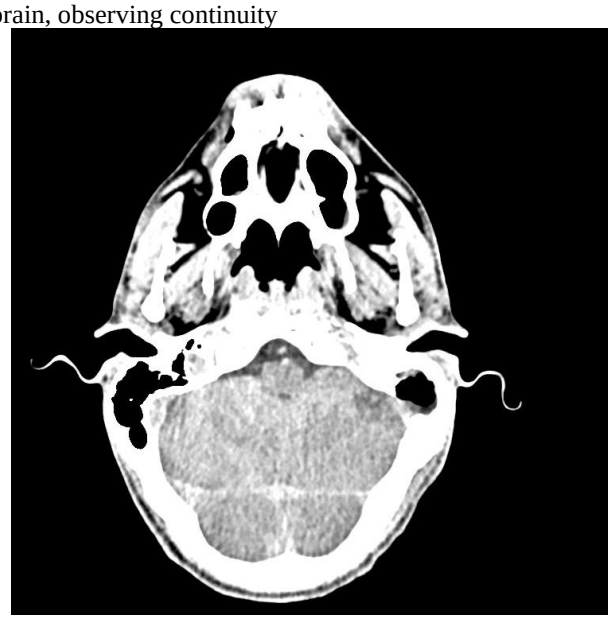
Source: personal collection

Image 2 – CT scan of the skull in the bone window showing acute otomastoiditis



Source: personal collection

Image 3 – CT scan of the skull in the cerebral window showing acute otomastoiditis, with erosion of the floor that separates the mastoid from the brain, observing continuity



Source: personal collection

Image 4 – CT scan of the skull in the bone window showing acute otomastoiditis, with erosion of the floor that separates the mastoid from the brain, observing continuity



Source: personal collection

REVIEW OF DIFFERENTIAL DIAGNOSES OF MENINGITIS

Meningitis can be caused by a variety of pathogens, including viruses, bacteria, fungi, and mycobacteria. In the case in question, the differential diagnosis initially considered viral meningitis, bacterial meningitis caused by other common pathogens, fungal and tuberculous meningitis. Each of these etiologies was investigated and excluded based on specific clinical and laboratory findings. (4)

MENINGITE VIRAL

Viral meningitis is commonly caused by enteroviruses, mumps viruses, herpesviruses, and arboviruses. These cases usually have a milder clinical course and cerebrospinal fluid (CSF) scans with lymphocytic pleocytosis, mildly elevated proteins, and normal glucose). In the case described, neutrophilic pleocytosis and reduced CSF glucose were inconsistent with a viral aetiology. (4)

BACTERIAL MENINGITIS BY OTHER PATHOGENS

The most common bacterial causes of meningitis include *Neisseria meningitidis*, *Streptococcus pneumoniae*, and *Haemophilus influenzae*. These pathogens are usually identified by CSF culture or antigen tests. In the case presented, CSF revealed the presence of *Providencia rettgeri* through culture, excluding other common bacteria. (4)

FUNGAL MENINGITE

Fungal meningitis, often caused by *Cryptococcus neoformans* or *Candida* species, is more common in immunocompromised patients. CSF in these cases usually shows lymphocytic pleocytosis, elevated proteins, and low glucose, with identification of the fungus by India ink or culture.In the present case, the specific bacterial identification ruled out a fungal origin. (4)

MENINGITE TUBERCULOSA

Tuberculous meningitis, caused by *Mycobacterium tuberculosis*, usually presents with an insidious onset with neurological symptoms and CSF changes similar to fungal meningitis. Specific tests such as PCR for TB or long-term cultures are required for confirmation. The absence of clinical and laboratory characteristics specific to TB helped to exclude this etiology. (4)

DIFFERENTIAL DIAGNOSIS NOT CASE REPORT:

As described in the case, the patient had clinical symptoms suggestive of meningitis, and then a cerebrospinal fluid test was performed. The patient had 576 leukocytes per mm3 (81% polymorphonucleates), glucose of 5 mg/dl, proteins of 182 mg/dl. Latex for bacteria negative, VDRL negative. This pattern is suggestive of bacterial infection, seen as leukocytosis, at the expense of polymorphonucleates, in addition to excessive glucose consumption. This fact is confirmed with the growth of *Providencia rettgeri* in culture medium.

REVIEW OF EXISTING LITERATURE

Providencia rettgeri is a rare gram-negative bacterium belonging to the Enterobacteriaceae family, generally recognized for its association with urinary tract infections and occasionally with

more severe infections such as meningitis. The literature on *Providencia rettgeri* as an etiologic agent of meningitis is limited, reflecting its rarity in this context. Documented cases often highlight the importance of early diagnosis and appropriate antimicrobial therapy due to the antimicrobial resistance it can present.

RARITY OF INFECTION AND PARTICULARITIES

Providencia rettgeri *infection* is uncommon, which can lead to diagnostic challenges. It has intrinsic and acquired resistance mechanisms that can complicate treatment, making it potentially resistant to multiple antibiotics. The ability to form biofilms also contributes to their persistence in hospital settings and the spread of infections.

DIAGNOSTIC AND THERAPEUTIC CHALLENGES

Diagnosing Providencia rettgeri meningitis can be challenging due to its similarity to other enterobacteria and the need for specific laboratory tests for accurate identification. The choice of antimicrobial treatment should consider the local resistance profile and the results of susceptibility testing. The combination of antimicrobial agents may be necessary due to frequent resistance to first-line antibiotics, as we saw in the case report (Association of meropenem with vancomycin)

In summary, while *Providencia rettgeri* is an uncommon cause of meningitis, its growing antimicrobial resistance and associated diagnostic challenges highlight the importance of epidemiological surveillance and careful clinical management to improve patient outcomes

DISCUSSION

Meningitis caused by *Providencia rettgeri* is a clinically challenging and uncommon condition. This bacterium, a member of the Enterobacteriaceae family, is most frequently associated with urinary tract infections and is rarely identified as the etiologic agent of central nervous system infections. A review of the existing literature reveals that documented cases of meningitis caused by *Providencia rettgeri* are limited, reflecting its low incidence and highlighting the importance of case studies for a better understanding of this condition (7)

The rarity of this infection contributes to significant challenges in diagnosis and clinical management. Healthcare professionals' lack of familiarity with this bacterium can result in delays in diagnosis and inappropriate treatment initially, which can adversely affect patients' clinical outcomes. Therefore, awareness of *Providencia rettgeri* as a potentially pathogenic pathogen in systemic infections, including meningitis, is crucial to ensure appropriate therapeutic intervention from the early stages of the disease. (8)

A distinctive aspect of *Providencia rettgeri* is its ability to develop antimicrobial resistance, which can further complicate treatment. Epidemiological studies indicate that this bacterium may exhibit resistance to multiple antibiotics, including those commonly used to treat central nervous system infections, such as ceftriaxone and ampicillin (Jean et al., 2014). Therefore, the initial choice of antimicrobial therapy should be guided by susceptibility test results, with consideration for the use of combinations of agents to optimize treatment efficacy. However, we must emphasize that in case of diagnostic suspicion of meningitis, we must start empirical treatment, following the current guidelines in addition to recommendations from the hospital infection control center of your workplace, so as not to delay the therapeutic approach.

Diagnostic challenges associated with *Providencia rettgeri* meningitis include the need for specific laboratory methods for accurate identification. This is crucial due to the phenotypic similarity of this bacterium to other members of the Enterobacteriaceae family, which may result in initial diagnostic confusion. Methods such as MALDI-TOF mass spectrometry and molecular testing are essential to differentiate *Providencia rettgeri* from other common bacterial species involved in meningitis (7)

In addition to the diagnostic challenges, the therapeutic management of meningitis by *Providencia rettgeri* requires a multidisciplinary and individualized approach. Antimicrobial therapy should be adjusted according to the results of susceptibility testing and closely monitored to assess the patient's clinical response and eradication of infection. In severe or complicated cases, consideration of neurosurgical interventions may be necessary to relieve intracranial pressure or treat complications such as brain abscesses. As in the case addressed, the patient had a continuous infection with the inner ear and due to this he needed a surgical approach. (8)

The emerging antimicrobial resistance among strains of *Providencia rettgeri* highlights the continued importance of epidemiological surveillance and hospital-acquired infection control. Prevention strategies, such as the rational use of antibiotics and infection control measures, are key to mitigating the spread of this resistant bacterium and improving patient outcomes. Collaboration between clinical, laboratory, and public health teams is essential to address these growing challenges and ensure appropriate and effective management practices. (7)

Associating *Providencia rettgeri* with the prison system may be relevant due to conditions that often favor the spread of bacterial infections, including antimicrobial resistance. Prisons are environments where factors such as overcrowding, poor hygiene, and limited access to adequate health care can increase the risk of infections. (3)

POSSIBLE APPROACHES TO REDUCE PRISON INFECTIONS

Improvement of hygiene conditions

Implementing educational programs and strict hygiene practices within prisons can reduce the spread of pathogenic bacteria like *Providencia rettgeri*. This includes regular access to clean water, adequate sanitation facilities, and the promotion of personal hygiene practices among inmates. (2)

Tracking and epidemiological surveillance

Establishing pathogen tracking programs among inmates and prison staff can aid in the early identification of infections. Regular epidemiological surveillance can monitor the prevalence of bacterial infections and identify potential outbreaks, allowing for a rapid and effective response. (2)

Improved access to health

Ensuring that all inmates have timely access to adequate healthcare, including regular medical checkups and treatment for infections, is critical. This can help in the early detection of infections and the implementation of appropriate preventive and therapeutic measures. (2)

Antibiotic Control and Antimicrobial Resistance

Implementing strict antibiotic prescribing policies and infection control practices can help minimize the development and spread of antimicrobial resistance among prison populations. This includes education on the proper use of antibiotics and monitoring for bacterial resistance. (2)

Impact on public health

Reducing infections within the prison system not only improves the health of inmates, but also has significant impacts on public health in general (2)

Prevention of community outbreaks

Prisons are entry and exit points to the community. Reducing the prevalence of bacterial infections like *Providencia rettgeri* inside prisons can decrease the chance of outbreaks spreading to the general population. (2)

Reduction of healthcare costs

Treating resistant bacterial infections can be extremely costly. By preventing infections within prisons, health systems can save significant resources that would otherwise be used in the treatment of complicated infections. (2)

Improvement in the quality of life of inmates

Reducing infections not only prevents health complications but also contributes to a safer and more humane prison environment, improving the quality of life for inmates. (2)

In summary, addressing infections like *Providencia rettgeri* within the prison system not only protects the health of inmates but also has a positive impact on public health and health resource management. Implementing preventive measures and improving access to healthcare are essential steps to mitigate the risks associated with bacterial infections in correctional settings.

CONCLUSION

The case of meningitis caused by *Providencia rettgeri* illustrates the complexity and challenges associated with the diagnosis and treatment of rare bacterial infections. This bacterium, although uncommon, has antimicrobial resistance characteristics that can significantly complicate clinical management. The literature review and case studies highlight the importance of prompt identification of the pathogen and the appropriate choice of antimicrobial therapy to improve patients' clinical outcomes. (10)

IMPLICATIONS IN CLINICAL PRACTICE

Meningitis by *Providencia rettgeri* underscores the need for constant surveillance and infection control in high-risk settings, such as prisons. Improving hygiene, implementing educational programs on rational antibiotic use, and ensuring adequate access to health care are essential to prevent and manage bacterial infections within these vulnerable populations. Additionally, strict epidemiological surveillance can aid in the early detection of outbreaks and the implementation of effective preventive measures. (11) (12).

SUGGESTIONS FOR FUTURE RESEARCH

Future research on meningitis in at-risk populations, including inmates, is needed to better understand the epidemiology and risk factors associated with severe bacterial infections. Studies investigating the antimicrobial resistance profile of *Providencia rettgeri* and other bacteria in prison settings are key to guiding infection control policies and optimizing treatment strategies. In addition, investigations exploring new diagnostic and therapeutic approaches can help improve the clinical management of these complex infections.

In summary, the case of meningitis by *Providencia rettgeri* underlines the importance of epidemiological surveillance, infection control, and ongoing research to address clinical and public health challenges in prison settings and beyond. Multidisciplinary collaboration between health

professionals, researchers, and health policy makers is essential to mitigate the impacts of these serious infections and improve patient outcomes.

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The rivers and their fantastic beings from Amazonian literature

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Maria da Luz Lima Sales[1], Carlos Wilker Silva de Sousa and Luiz Henrique Rocha Mendes

ABSTRACT

The research deals with the elements that unite the popular imagination and the rivers of the Amazon. The river has unrevealed secrets that allow the creation of supernatural narratives and phenomena, providing the formation of a unique literary identity, surrounded by mysteries and fantastic beings. From this arises the objective of understanding the role of the river and its aspects in the construction of Amazonian literariness. Documentary research was used, which was guided by three types of reading: exploratory, analytical and comparative. The research was based mainly on Loureiro's literary theory, published in *Cultura Amazônica: uma poética do imaginário*, which uses a plurivalent methodological approach, passing through aesthetics and socioethnoanthropology, to "wander" through the Amazonian culture. As a result, three themes related to the mythological apparatus of the Amazonian aquifer were selected: the Boto, seducer of the Amazonian waters; the fearsome snakes of the Amazon; and the enchantments of the waters. Each category formulated sought to debate the origins, forms and symbolic representations of its contents. Thus, the present work intends to contribute to the expansion of studies on this theme and to form a small theoretical framework that allows us to understand the meaning of local mythopoetics in regional cultural formation.

Keywords: Myths, Legends, River, Imaginary, Literary identity.

[1] Highest Degree of Education: Doctorate
Academic institution: Federal Institute of Pará (IFPA)
E-mail: maria.luz@ifpa.edu.br
ORCID: https://orcid.org/0000-0002-4968-0540

INTRODUCTION

Discussing the myths and legends that permeate the rivers of the Amazon is not a simple task, since a multitude of narratives made by different authors in different contexts have always been part of Amazonian daily life since the dawn of humanity. Stories are never told in the same way and we will never have the *truth* about the mysteries of the waters. Considering the complexity of understanding the essence of the Amazon, we can use Literature and literary studies as valuable tools for understanding this culture in particular. The expression of literary art emerges as the only one capable of deciphering the intertwining between the real and the imaginary contained in the myths and legends of the Amazonian imaginary.

The Amazon has two historical characteristics that can explain the origin and transformation of its narratives: isolation and mystery. Founded on extractive work and cabocla settlement, the region has an intense connection between man and nature. The riverside dweller, isolated from the chaotic world of the cities and surrounded by the mysteries inherent to the forests and rivers, seeks explanations of his daily life from oral tales and customs of his ancestors, mixing reality and myth. According to Loureiro (2015a), writer and theorist of Amazonian literature, this meaning of life allows the formation of an isolated universe where myths and aquifer legends merge with reality and form a society with unique characteristics that differentiate it from the rest of the national set.

In particular, the river has a multitude of unrevealed mysteries that allow the creation of supernatural narratives and explanations for everyday situations. Hence the scientific interest in exploring this specific point of the mythological universe of the Amazon region and exposing an image of it in this work. As the objective of this explanation, we identify two fundamental aspects for this work: to understand the symbolism of the waters and their relations with the myths and legends of the Amazonian rivers; research some myths and legends related to water contained in Amazonian literature in order to form a small cultural collection. Based on the statements initially presented about this magical environment and on the studies of Loureiro, Cascudo and other researchers and poets who deal with the Amazon, this study aims to understand the role of the Amazonian waters, the river as a symbolic element and its mythological aspects in the construction of Amazonian identity and literature.

Starting with the theoretical conception exposed and aiming at achieving what is proposed, the research was organized as documentary, that is, exploratory, analytical and comparative reading, which focuses on literary publications written by authors who discuss Amazonian themes, using myths and legends related to the river as a source of inspiration and as an element of the text. We delimited the importance of these different types of reading during this study primarily, but also of others, in the exploratory reading of varied works and academic productions of literary theory, as well as prose and poems by authors who contained the proposed theme.

This work will deal in three moments: the river, the authors, prose writers and poets who stick to its mysteries and symbols, as well as some theorists who study the meanings of the aquatic element; the narratives wrapped in the river, which surround this fantastic universe, as well as the metamorphosis of some of its beings, in order to preserve and value its mythology, which comes from the first men/women of oral culture who inhabited this planet; of the fantastic of Amazonian literature, citing and commenting on some wonderful beings, namely, the Boto, seducer of the Amazonian rivers, the enchantments of the Iara and the Vitória-régia, and the Cobra-Grande, the serpent that navigates in river waters, bringing fear to its inhabitants.

THE RIVER: ITS MYSTERIES AND SYMBOLS

Water, in addition to being materially linked to the existence of life, constitutes an element inscribed in the symbolic domain, evokes imaginary aspects, cradles dreams and is a source of poetic inspiration according to Cunha (2000). The author broadens the perception, reporting that this fluid is in all fields: in myths and history, in nature and culture, in life and death. We have, therefore, the perfect scenario for the emergence of fantastic beings, societies and entities coming from within the submerged mysteries of the rivers. The dolphin, the snakes, the Iara, the enchanted islands of Marajó are supernatural creations that, at the same time, symbolize the sacred and the imaginary, explain the existence of everyday customs and behaviors. Traditional narratives constitute sources of historical, ethnographic, sociological and legal information, indicating that the tales represent a "living document, denouncing customs, ideas, mentalities, decisions and judgments" (Cascudo, 2004, p. 10).

From Cascudo's reading, important works are extracted, in addition to short stories, legends that may reveal fears to subliminally symbolize marks imposed by colonizers, which later served for educators to use them as an instrument to control children, with chilling beings such as Matinta Perera, Cobra Grande and other entities. Thus, it is inferred that such narratives are a form of cultural preservation that contain essential elements of the identity of the riverside dweller. The theme of this research is mainly worked on by Loureiro (2015a), who addresses the foundations of the Amazonian imaginary and its implications.

The presence of the river as an element of Amazonian literary writing stands out in a striking way. It can be found in different nuances: in the form of a street by the hands of Ruy Barata in the song "Esse rio é minha rua"; as the home of several fantastic creatures according to the reports of Monteiro (2007), as a source of nostalgia for Jurandir (1997) in one of his novels; or as the "home" of creatures such as the Acauã, a mysterious enchantment narrated in short stories by Inglês de Sousa (2007), and of the mythical Amazonian serpents. Whatever the figure, one fact is certain: the river is a rich source of literacy and a primordial component of Amazonian culture.

Loureiro dialogues about what he calls the Amazonian world and about the importance of rivers in the cultural formation of man, stating that the river is the origin of man, that is, a place of countless symbols and meanings, intimately intertwined with the destiny of ordinary individuals. For Loureiro (2015a), such aqueous flows constitute an essential cause of the life of the riverside dweller and confer an *ethos* to the existence of the native. The author cites Bachelard (1998, p. 17), who expands Lour's view of the meaning of the river: "In this way, water will appear to us as a total being: it has a body, a soul, a voice. More than any other element perhaps, water is a complete poetic reality."

Expanding the debate, Loureiro (2000, p. 8) describes:

> Rich in plasticity and innocent magic, the Amazonian nature reveals itself as belonging to a mythical age, full of freedom and telluric energy. It is situated in cosmic time in which everything springs up as in the primeval sources of creation: the forest, the rivers, the birds, the fish, the animals, the man, the myth, the gods. It is in this context that the imaginary establishes a communion with the marvelous, becoming a propitiator of epiphanies. Under the sfumato of reverie fertilized by the contemplation of the river and the forest, looking at the horizon of the waters that seems to him like the line that demarcates the eternal, the man of the Amazon has been dominating nature while being dominated by it.[2]

Studying the mythological and legendary accounts of Amazonian rivers is a fundamental part of understanding the Amazonian imaginary and the affirmation of regional identity. Myths and legends are, therefore, a mixture of fantastic narrative with elements of the reality of the riverside man, serving as an instrument for the debate about social problems and about the way of life of the man who survives on the banks of the rivers (Ribeiro; Belo, 2020, p. 53). The world of the rivers is that of the interior, far from the capitals, perhaps, therefore, it is a complex task for the city dweller to understand the intertwining between the caboclo and the river. The following passage, by Loureiro, clarifies a little more about such mysteries:

> This magical world that glides on the surface of the waters obliged, at the time of its occupation or the formation of the cities, conquerors, dreamers, doctors and adventurers who, in the shadow of the magnitude of its opulence, idealized a bridge in infinity, the connection between two opposite, disparate, irreconcilable worlds.[3]

To understand the mysteries of rivers, it is important to analyze the metaphorical perspective because, symbolically, the river refers to numerous meanings. Chevalier and Gheerbrand (1988, p. 781) relate the river to life, fertility, death and renewal. The fluidity of the waters refers to the course of life and its end, death. Fertility comes from the fact that, without the water from the rivers reaching the inhabitants, it is impossible for the natural resources necessary for man to exist. Finally,

[2] LOUREIRO, João de Jesus Paes. Reverie meditation: between the river and the forest. In: SIMÕES, Maria do Socorro. Belém: IFNOPAP, 2000, p. 8.
[3] LOUREIRO, João de Jesus Paes. Amazonian culture: a poetics of the imaginary. Belém: Cultural Brasil, 2015a, p. 214.

the concept of renewal can be explained by the philosopher Plato about the words of the pre-Socratic Heraclitus (540-470 B.C.), when he stated that it is not possible to enter the same river twice (Souza, 1996), that is, just as the river is renewed, man is also never the same as before, and that, therefore, he is in constant transformation.

THE MYTHS AND LEGENDS SHROUDED IN RIO: TRANSFORMATION AND PRESERVATION OF AMAZONIAN MYTHOLOGY

The fantastic world that makes up the vast Amazonian literary framework is populated by several myths and legends that, in addition to serving as a literary source, are useful to have a conception about the origin and constitution of the society of this region, especially of long-lasting conflicts, taking into account that the Amazon belongs to a colonized country. The fantastic story called myth refers to the narrative of creation and origin, to a sacred story, whose characters are supernatural beings, usually gods and demigods (Eliade, 1972); or it constitutes an account of man's search for truth, for the meaning of his existence and the meaning of life since the dawn of time (Campbell, 1990). Lévi-Strauss (1957) believes that the study of myths serves to elucidate important aspects of human behavior and action. Narratives considered legends, on the other hand, always refer to an oral or written text, with the use of the marvelous through which real episodes are transformed, through popular creativity and poetry, into narratives that belong to a specific region and that remote to the beginnings of the first generations that inhabited the planet.

Amazonian mythology goes back to the beginnings of the so-called *discovery* by Portugal, an erroneous term because there were already societies inhabiting it, in formed societies, living according to its *ethos*. Chronicles dating between 1600 and 1700 narrate the presence of the powerful country of the Amazons (Icamiabas) which, according to reports of the time, made by the first explorers, lived at the top of the course of the Rio Negro. Carvajal, who accompanied Orellana on his expeditions on the Amazon River, claimed the existence of a community whose warriors were commanded by a small number of women: the country of the Amazons (Porro, 2020).

This was initially a Greek myth that remained in the imagination of Spaniards still in the Andes (Porro, 2020). As in other legends and myths, other authors have taken it upon themselves to expand and flourish stories about the indigenous warriors, the first nations to suffer conflicts between cultures, resulting in new beliefs, such as that of the myth of the Icamiabas, the bearers of the muiraquitã (Melo, 2004). Teixeira, in the preface to the book that deals with Loureiro's Amazonian culture, points out the importance of the various peoples who once inhabited the Amazon region, confirming that any author who ventures to write about it, "whether in the field of poetry, prose, philosophy, history or other sciences, will not fail to come across the Amazon built by foreigners" (Loureiro, 2015a, p. 11).

The Amazon is, therefore, the result of the combination of cultures of various origins. The counterpoint between native and colonizer is a fundamental characteristic for understanding the transformation of the Amazon and its literary languages. After all, many have traveled through it at different times (because, until today, Brazilians and foreigners are looking for treasures supposedly lost in distant locations) and with different objectives in search of deciphering the unknown and the unusual, as well as other riches, let's say pecuniary (Carvalho, 2006). It is no coincidence that the region became known by several designations during its history, such as "green hell", "paradise lost", "eldorado", "country of the Amazons", "paradise" and "lands without evils" (Loureiro, 2015a, p. 22). From the concepts exposed, this research sought to collect as many myths and legends as possible related to the rivers of the Amazon in order to form a small theoretical framework on the subject, since it is inexhaustible. As a result of the investigation, we cataloged narratives related to the river, considering the diversity of views in the works of the main literati of this immense region.

THE FANTASTIC AND AMAZONIAN LITERATURE

To enter the universe of Amazonian enchantments, it is necessary to consider the path of some theories of the category of the fantastic in literature. Its definition, however, is not easy to answer. At the beginning of the journey, in the eighteenth century, writers such as Hoffman and Eichendorff already used this term to designate a genre, but the fantastic gained strength in the nineteenth century with the writer Allan Poe, who even built a model of structural composition for texts of a fantastic nature. Todorov (2004), representative of French structuralism, proposes in his work a new understanding of the fantastic, becoming a primordial theoretical contribution to studies dedicated to this literary category between the eighteenth and nineteenth centuries, especially in Europe.

Todorov conceptualizes the fantastic as a hesitation between the natural and supernatural worlds within the events of a narrative. He states about the fantastic that those who "perceive it must choose one of the two possible solutions"; it is either an "illusion of the senses, a product of the imagination, and in that case the laws of the world continue to be what they are; or else the event actually occurred, it is an integral part of reality" (Todorov, 2004, p. 30, 31). That is, the laws of this parallel reality are unknown to the reader.

The process of assimilation is the means by which certain elements are introduced into the imaginary, as in the case of Amazonian culture (Carvalho, 2014). Thus, the author explains, giving as an example Christian catechesis as an attempt to erase the superstitious character of the riverside man, resulting in the integration of elements from two different cultures. This process of assimilating exogenous culture, at first seeming strange, but interconnecting the new culture to the old, making the two one, and establishing "the local imaginary, in which children, from an early age, hear from

older people the fantastic stories, legends and mythical narratives, full of mysticism, animals, sorcerers and shamans (Carvalho, 2014, p. 222).

BOTO: THE SEDUCER OF AMAZONIAN WATERS

The Boto is one of the beings that are part of Brazilian folklore, especially in the North region. On the Amazon River, the dolphin's cycle is loaded with a vast loving memorial. According to Cascudo (2012a), he is a conqueror and the father of thousands of children, *daughters of* dolphins. Legend has it that the red dolphin appears in the dances of the riverside communities dressed in white and seduces young married and single women, involving them in a Dionysian ecstasy capable of taking them out of reason and leading them towards the pleasure of the sensual moment.

The only identifier of the Boto would be a hole that he would have in the middle of his head, but the white hat prevents people from seeing this specific trait. If the woman becomes pregnant because of her involvement with the cetacean, she is not condemned by her husband and the community. In this case, the understanding and acceptance of the act is seen as something inevitable, the result of the relationship with the supernatural (Loureiro, 2015a). The Dauphin is a lubric symbol, since since classical antiquity it has been dedicated to the Greek goddess of love Aphrodite or Venus, in the Roman version.

The hybrid appears "snoring in heat, next to the resplendent goddess. Venus, the sea goddess, has her most popular evocations indicating a predilection for her origin" (Cascudo, 2012a,

p. 143). It is in almost all depictions of Aphrodite's birth. The folklorist comments on the direction that Couto de Magalhães gave to the dolphin through his material collected from reports. For him, the aquatic animal is the incarnation of the protective spirit of fish, the Uauiará. The being that transforms into the Boto is a great amateur of the indigenous women and many of them attribute their children to the cleverness of the enchanted being.

Transformed into a boy dressed in white at parties, he demonstrates skill with dance and draws attention for his beauty and elegance. He can also appear "in the bedroom and lie in the hammock with the woman who intends to seduce [and] impregnate women who, being menstruating [...]" (Loureiro, 2015a, p. 221) looked at him; either because he rocked the canoe in which the victim was, or from somewhere near the river. Cascudo (2012b) presents other versions of the behavior of this entity in neighboring countries. Although there are many similarities, the absence of singing in the dolphin is an element in common with our culture.

There are two types of dolphins in the Amazon, the pink and the black, each of different species, habits and traditions: the black dolphin (tucuxi) is the incarnation of the protective spirit of the fish, helps the riverside dwellers in cases of flooded canoes and saves them from drowning; the pink dolphin, however, is dangerous (Alves and Pereira, 2007). The dolphin is attributed with stories

of enchantment against married and single girls. And since the nineteenth century, the pink dolphin has been believed to transform itself into the *Don Juan* of the waters (Fares, 1996). Addressing Cascudo, Fares does not find him in texts by chroniclers and travelers of the sixteenth and seventeenth centuries, despite the fact that the colonization of Brazil began in 1500. It was only in the nineteenth century that the naturalist Beates (1864) talks about him, with the belief of becoming a conqueror (Fares, 1996, p. 54).

Its late appearance in the pages of Amazonian folklore leads the researcher to believe that the legend did not originate from the aborigines. First, the relationship between animals and humans was not part of the daily life of the indigenous people; These were also, in general, polygamous, so it would be difficult for a legend laden with taboos about polygamy to be created by them. In addition, it is unlikely that they were linked to the taboo of menstruation. Referring to Caminha's letter, Fares comments that the taboos came here by those who were shocked "by the nakedness of the Indian, to the point of referring to sex as *shame*" (Fares, 1996, p. 61).

Considering that, supposedly, the legend of the Boto was brought by a nation that was scandalized by indigenous nudity and that infused miscegenation in Brazilian lands, the dolphin, as we know it today, is the result of a process between whites, mestizos and riverside indigenous people, that is, colonizer and colonized, settling new interdicts in the culture. The legend is explored by several Amazonian authors, such as Veríssimo, Alcyr Meira, Paulo Nunes and others, especially Siqueira and Larêdo, who present a vast set of works dedicated to this legend.

Due to the process of miscegenation in Brazil, it is possible that there are versions in which the dolphin presents itself as a foreigner, seen in the nineteenth-century short story "O boto", in which it is read that Rosinha, the daughter of a prosecutor, was deceived by a young man described as a Portuguese, with "a white shirt and straw hat, from a foreign factory" (Veríssimo, 2013,

p. 151) and promises marriage to the girl. She was pregnant when Boto dies from an alligator attack, leaving the baby without a father. In view of this, the tapuia nanny, who had facilitated the meeting of the two, decides to tell society that the girl was the victim of a dolphin.

Even after the advent of an exogynous being who infiltrates parties by the river, impregnates girls and settles in the Amazonian imagination, there are also works that, centuries later, sadly express the fact of the abandonment of the Boto in more traditional narrative accounts. This is the case of the writings of Loureiro (2015a), one of the main references on the studies of the Amazonian imaginary, an author whose texts served as the basis for most of our studies. Two important works in relation to the enchanted dauphin will be mentioned here.

In the first, Loureiro (2008) considers the bottom of the river as corresponding to the Greek Mount Olympus, inhabited by the deities that make up his Amazonian theogony in ancient mythology. One of the chapters is dedicated to poetry, as an enchantment of language, discussing the

foundations of poetic art and reflections on the theories of the creation of a poem. The writer presents his "Dionysian Hymns to the Boto", a selection of poems, which celebrate the enchanting cetacean and its sovereignty within an aesthetic stained glass window.

The second is a poetic panel on the Amazon from its culture and history (Loureiro, 2015b). It is divided into three parts, each corresponding to a book that makes up the trilogy: "Porantim" (assorted Amazonian poems), "Deslegendary" (about the virgin Amazon desecrated by the business animal, that is, there is a process of deconstruction of myths and legends) and "Altar em Chamas" (in which he writes about themes related to the Amazonian world). In general, the poems express the loss of the magical character of the Amazonian dauphin, devoid of the enchanting charm. With such a loss of role within the imaginary, the Boto is increasingly evident as an explanatory element for the reality of the riverside dweller in the face of problems such as sexual abuse, teenage pregnancy, incest, etc., as stated in "Deslenda Narcísica do Boto X" (Loureiro, 2015b, p. 198): "Under the syllables of the sun / Under the syllables of the sun / Under the syllables of the sun / the rivers dry up / Boys thrown into the air / become birds. / And they flew. / Others, old detribated chiefs, / rose to the sky and became rain."

In *the boys become birds*, there is an allusion to the cases of babies who, generated by single mothers, are abandoned because they are *the children of dolphins*. The poem "Deslenda Rural V", from the same book, confirms the criticism, as "large landowners" and lawyers "killed dolphins, uiaras, curupiras", according to the excerpt (Loureiro, 2015b, p. 169,170): "The large landowners / hired / gold lawyers / and, cautiously, rented the rage / available from gunmen / Gunmen who, at the decided time, / killed dolphins, uiaras curupiras". This set of poems that make up *Deslenda*, in general terms, expresses the concern of the lyrical self with the death of the Amazonian man, because, for the poet, "when the man is killed, the legend dies". In view of such a statement, we could even say the reverse: when killing the legend – and, consequently, the myth – man himself or a little of him dies, as a human and poetic being, constituted by sensitivity and fantastic imagination.

Juraci Siqueira, author of several books, is also one of the main Amazonian poets who repeatedly use the theme "boto" in his works, calling himself the son of Boto and known as "Juraboto", emerging a literary production bathed in Amazonian subjectivity, so that life and work are confused (Silva, 2015, p. 38, Apud Belo; Mello, 2021, p. 38). In other words, Juraci's poetics emerges from nature and describes cultural elements of the Amazonian world that were present in periods of his existence. The river is one of those elements that are intertwined with the life of the Amazonian subject, in a dialectical relationship, as we can see in the poem "O Boto (des)Encantado", by Siqueira (2007), in which the poet brings out the cosmogony of myth and its transfigurations bathed by the water of the imaginary. The banks of the river, a privileged place in the archives of

Amazonian culture, represent this phenomenon constituted mainly in a collective way (Belo; Melo, 2021).

The writer Salomão Larêdo is part of the Brazilian *fantasy movement*, which addresses contemporary literary phenomena by thematizing fantasy and other aspects of the fictional unusual (Cabral; Tavares; Cordovil, 2020). His book *Chapéu Virado: a lenda do Boto* (Larêdo, 1997), one of the best known when it comes to Boto, tells the story of Chica, an anthropologist who, during a vacation in Mosqueiro, gets involved with a boy who later disappears. Swept away by the memories of a quick and intense affair, the girl decides to look for him at all costs on the island.

Although the seducer of the waters is reputed to attract and manipulate girls, there is in one of his representations the symbolization of the opposite, namely, the appearance of the dolphin as a punishment to those who deserve it. "The Jew's Ball" by Inglês de Sousa (2018) narrates the events of a party organized by a Jew and considered immoral (Sousa, 2018) and, according to the narrator, the participants were, sooner or later, punished for their involvement in the party. At a certain point, a "short, ugly, long-jacketed and collapsed hat" (Op. cit., p. 80) entered the hall and led the most beautiful girl at the ball to a dance. Suddenly, the man drops his disguise, revealing his demonic image and drags the girl into the water, before the eyes of everyone present. The action of this man-boto is different from that of his more diffuse versions, because, instead of dragging the young woman without being seen, the seducer establishes a gloomy atmosphere in the party, resulting in the dispersion of the guests. The action of the dolphin represents a punitive response to the pagan character of the festival, reestablishing the normality of the social order. Other beings of the rivers, whose stories are related to the punishment against those who transgress an order, will be better observed below.

ENCHANTMENTS OF THE WATERS: IARA, WATER LILY...

"Iara, Mermaid, Ondina, Loreley, Mãe-d'Água, Iemanjá" are some of the designations that Vicente Salles cites, according to Loureiro (2015a, p. 271), who also attributes this myth to femme fatale, emphasizing her cultural convergence in the mythical Amazon. The Iara, a legend with an indigenous soul, lives at the bottom of the rivers and attracts young people with its Europeanized face, leaving the tail of a fish submerged in the river, sung and decanted in verse and prose by numerous authors, such as Bruno de Menezes, Marques de Carvalho, Walcyr Monteiro, among others.

Unlike Boto[4], Iara is equipped with a sensual song and invites the boy enchanted by her to visit the bottom of the river's waters, under the promise of endless happiness in her submerged palace. The imagetic aspect of the Mother-of-Water is expressed in Loureiro, so that the physical

[4] He does not sing, as pointed out earlier.

characteristics of this mermaid are understood in its sense of epiphanying of the waters that the legend represents. The author comments:

> Iara's long hair is combed by the waves. Iara herself is presented as if she were combing, in the mirror of the waters, her long and greenish hair. The crescent moon, it is also said, combs the waves of the river. [...] A head of hair that floats on the waves, intertwined in the waves, mistaken for the waves.[5]

It is true that the young men who gave in to Iara's request never returned. Loureiro also points out the relationship of water directly with death, that is, with the desire for suicide, provoked in the victim. Death, however, is not the primary objective of the one who enters the waters, because it is known that, while one is human, one cannot breathe in water. From the physical aspect, there will be a renunciation to the detriment of another form of life. The young man in love with her "Dies to be reborn enchanted, inhabitant of the enchantment at the bottom of the river" (Loureiro, 2015a, p. 274).

Paulo Nunes (2006), writing literary and didactic texts, also mentions, in one of his poems, that there is the promise of a submerged kingdom to the one who renounces life, attracted by hair that is confused with the tangle of water, as in the following poem:

> The waters are flames of black and long water lilies.
> A young man listens to the singing [...]
> The flowers of the party bloom with happiness because Uiara was enchanted mermaid for tchibum... Take the guy to the kingdom
> of the clear waters. (Nunes, 2006, p. 6)

It is important to highlight the presence of the mythical conception of the six o'clock hour, mentioned in the poem as representing the transition from light to darkness. Puente (2013, p. 67) associates the night with the moment of nightmares and revelations, relying on Freud, when he states that sleep appears as a background for the projection of dreams: "In dreams, we have the feeling of accessing another world". Both water and darkness are associated with the image of women, as Chasqui and Machado (2021) point out about water as a symbol and metaphor of the feminine.

This moment of passage is commonly associated by the countryside as an opportunity for the appearance of dark entities, especially due to the fact that the night is condemned in biblical passages, in which its meaning is loaded with negative conceptions. A great representative of a cultural convergence, as Salles (1988, apud Loureiro, 2015a) observed, the legend of the Iara, since its origin, has crossed millennia and has been the subject of several works by literati, including regional ones.

The legend of Iara causes the convergence between cultures and runs through several generations of poets and prose writers. Loureiro (2015a) states that the belief in the existence of this

[5] LOUREIRO, João de Jesus Paes. Amazonian culture: a poetics of the imaginary. Belém: Cultural Brasil, 2015a, p.274.

face that Mãe-d'Água offers is a case of cultural verisimilitude, conceived as a daydream of the Amazonian man, within a continuous imaginal process. Death, as one of the various faces of the Amazon River, is present in other myths related to water. The myth of the Vitória-Régia, in more widespread versions, has plots that culminate in the renunciation of life in favor of the enchantments at the bottom of the river. Traditionally, the story of the indigenous Naiá, who was in love with the moon, Jacy, is told, according to Couto de Magalhães (1940). Gomes and Christo (2020) summarize the three main interpretations of this myth; and, although the Moon is considered a feminine entity, these tell versions that establish the male presence as a representation of the star.

In the first version, Naiá spends her nights walking in the woods, obsessed with finding her beloved. One day, resting on the edge of a lagoon and saw reflected in the waters the image that she was so much chasing. Without hesitation, she dived to meet them and drowned. Shaken by what happened, Jacy tried to compensate for her sacrifice, transforming her into a "star of the waters, a true exuberance of beauty and perfume" (Gomes; Christo, 2020,

p. 267). The palm of the leaves of the water lily is dilated to better receive the caresses of the Moon. Its flowers open at night, exhaling aromas expressing the loving devotion of the cunhã.

In the second version, the Moon had the power to transform the indigenous people into stars. Among the cunhãs, there was one that wished to be transmuted, in order to materialize its union with the Moon. In love, she tried to reach it, climbing hills and mountains, however, it was only on a day of delight by the river that she noticed its presence. From the depths of the water she saw the reflection of the moon, as in the first story, but this time with an inviting song. He then threw himself into the river, culminating in his drowning. Dismayed, the Moon turned her into a beautiful water star.

The third version differs from the others in that there are other members of the nation around who try to prevent Naiá from going to the water. But it is in vain, since soon afterwards they witness the immediate transformation of the girl into a flower, preceded by a bright light. Pereira (2001, p. 55) makes another narration, inspired by Perudá, "Tupi god of love, like Eros": he tells the story between Moroti and the warrior Pitá, which ends in death by drowning.

Some narratives add to the legend the presence of a sorceress, I Cunhã Pajé, who had lured Pitá to the bottom of the waters. He took advantage of his plunge to offer him a new life in the richest of the rooms of the diamond palace, and suggested getting Moroti out of his head. The native woman despaired of this loss and, advised by the shaman of the tribe to save her beloved and break the witch's curse, Moroti threw herself into the depths and disappeared, leaving a plant with white and red flowers on the surface (Abreu *et al*., 2000).

The danger that dwells in the depths, however, is not limited to hurting only those who sink in the waters. It is possible to find narratives from field research, in which the being who protects the

river amplifies the violence out of the water. A version of the Muirakitã, the sacred amulet of the Icamiabas, offers a backdrop that is very much in line with this aspect of the river, according to the Macurap, inhabitants of the Rio Branco. Mindlin (1999) shows the terrible fight between men and women, according to the song Koman Makurap.

The daughters of the Amazons stole frogs from the lake, without knowing that they belonged to Katxuréu, an old woman of the waters. She admonishes the girls, saying that frogs are not food, but her art (and music), teaches them the song Koman, so beautiful that they present it to their mothers and with this song, Katxuréu convinces the adults, seduced by the song, that she would teach them the song, if they killed their husbands, one a day and took their bodies to make a banquet. Indignant, the men began to live without women, but one of them had hidden his daughters, who were later forgiven, married and humanity grew again. The women in the song Koman, however, differ from those in other versions, in that they could not live without the men. This and other stories of the indigenous peoples of Rondônia are deepened in *Moqueca de Maridos: Indigenous Erotic Myths* (2015), by the author Mindlin.

In Amazonian literature it is also possible to find cases in which contact with the river occurs through a process of punishment that, commonly, comes from an enchanted being who takes revenge on an aggressor of nature. "The legend of Pirarucu", collected by Alves and Pereira (2007), tells the story of Pirarucu, a self-centered warrior, belonging to the tribe of the Uaiás, inhabitants of the southwest of the Amazon, critical of the gods and perverse. One day, while his father, Pindarô, was visiting a neighboring nation, he took advantage of the occasion to kill the inhabitants there. Tupã, observing his wickedness, decides to punish him. Another source says that the reason for the punishment of the "Legend of the Pirarucu", told by Amorim (2016), was different: the reason for the intervention of the indigenous god would have been the attempted murder of a deaf native (Iberê), who cried out for justice to his god.

The body of the indigenous man was dragged to the bottom of the Tocantins River and transformed into a dark, flat-headed fish. About the process of punishment in relation to water, Euclides da Cunha (2011) in "Judas Ahsverus" narrates a ritual performed by rubber tappers during Holy Week and known as Judas' workout, in which a doll made by the Amazonians with old cloths and tied to a raft to go down the river. As he proceeds through the waters, the participants in the rite curse him and stone him until the puppet finishes his trajectory (Cunha; Lucchesi, 2011), a process that demarcates the punitive and purifying character of the river.

However, in the short story "The Witch", by Inglês de Sousa (2007), the opposite happens: the river is thrown against the one who defies the enchantments. Maria Mucuim, a feared character from Paranamiri, in Óbidos, is a victim of Lieutenant Antônio de Souza, who used to invade her shelter to beat her and curse her as an accomplice of the devil. In response to the attacks, Maria takes

part in a flood that floods the city. With the water reaching through his chest, Souza is at the mercy of his wrath. Storms, lightning and thunder are elements associated with the intervention of superior gods, especially Tupã, who was involved in the creation of other legends, such as that of the Pirarucu and the Mapinguari. That said, it is likely that the flood of the English tale also had the endorsement of supreme deities.

It is observed that the aforementioned legends are recurrently constituted in sources that establish death as an aspect associated with water. Death is a multifaceted element in literature and in the regional popular imagination. The river, likewise, which has different faces, since it is accompanied by numerous attributes, consists of a wide "mythical stained glass window", like the Amazonian culture, with narratives that are "lyrical or erotic, naïve or malicious, simple or cunning, happy or tragic" (Loureiro, 2015a, p. 258).

THE FEARSOME SERPENT OF THE RIVERS

A gigantic serpent inhabits the depths of the riverside dweller's imagination. Cobra Grande, Mãe-d'Água, Mãe do Rio, Boiúna are some of the names by which the feared being is known. The probable origin of the snake dates back to the existence of the anaconda, the gigantic water snake that is capable of devouring adult men and even large animals, according to Cascudo (2012a). The large snake – holder of the night – is often pointed out only as a dangerous animal, however, it sometimes assumes the condition of divinity.

Corrêa (2018, p. 02, 03) points out that the Mãe-d'Água can present itself in three ways: as a serpent of immense proportions or an enchanted being, or even as a bewitched ship. In one of his books, Corrêa (2016) reports on the various types of large snakes that are well known through interviews and oral narrations collected in the Amazon. One of these examples is from Murinim, in Pará, where a popular tells the story of child abductions that occurred there. According to the narrator, once, an açaí seller, mother of three daughters, was approached by a strange lady who wanted one of them, but the mother denied. One day, the pracist left an açaí siding upside down and, at one point, the other, who wanted one of the children, took advantage of an opportunity and hid under the siding. One of the girls went to see the stranger who was hiding there and removed the lid. In its place, there was a snake that devoured her.

The narrative of the Big Snake can be seen in Melo's publication (2021), having been obtained through an oral account. It refers to Aunt Francisca, a character who worked aboard a boat which, at midnight, hits something and gets stuck. At that moment, a whirlwind appears around the vessel. Tia immediately recognizes the phenomenon and associates it with Boiuna. After a few minutes, a pair of glowing eyes burst in, shrouded in darkness, in the middle of the river. Desperate, she begins to pray. Upon seeing the show of respect, the snake leaves.

About the case in which the Big Snake presents itself as a ship, Corrêa (2018, p. 3, apud Hygino Amanajás, 1900) tells a story that occurred on Paçoca Island, in Pará, where there was a huge snake that lived there and, at night, with the entire island, they transformed into a ship. The enchanted ship went up the river sinking the boats it found along the way, leaving the souls of the drowned victims trapped inside it. In this context, the author refers to the image of Charon, the ferryman who, in Greek mythology, transported the souls of the dead to Hades (Corrêa, 2018, p. 3). This phenomenon occurred in both narratives, Loureiro (2015a, p. 240) classified as *semiotic conversion*, in which the vessel becomes the "concrete image of reverie, of the journey to other realities", symbolizing the desire to leave.

Another version of the snake, well known in Brazil, emerged during the modernist movement, in 1931, by Bopp with *Cobra Norato* (2004): a man strangles and steals Norato's skin and wanders through the Amazon rainforest until he reaches Belém, in search of Queen Luzia's daughter. On the way, he comes across trials and enchantments: he passes through seven doors, makes mirongas on the new moon, drinks three drops of blood. Bopp's work materializes the ideals of Modernism in its first phase and dialogues with the mythical potentialities of the Amazon.

In the context of the mythopoetics of the serpent, there is also "Acauã", by Inglês de Sousa (2007): the story of Captain Jerônimo Ferreira, from São Batista de Faro, father of a two-year-old girl. One day, when he was returning from hunting, he deviates from the path and only manages to reach the village when it is night. With the threat of a strong storm, the captain hears the cry of the Big Snake as in childbirth, the noise coming from a river in Nhamundá. He runs and falls on the threshold of his door, scaring away a bird that was singing "Acauã", "Acauã".

When he wakes up, the captain sees a canoe approaching and, when he pulls it, he finds that at the bottom of it there is a child, who rescues him and names him Vitória, bringing him home to raise with Aninha, his other daughter who had left him his wife. While Ana is kind, the other is aggressive and has a devilish look. The sisters maintained a tender and strange intimacy with each other, and in time Ana began to wither away, while Victoria grew stronger. On the day of Aninha's wedding, her sister appears in the church transformed into the figure of a Medusa, with the face of a serpent, the hair of snakes, standing, stiff as a dead man.

Niels (2020) reveals that when the strange girl appears in the church during the wedding, she presents herself as a gorgon, a being with evil powers equal to those of Medusa and Boiuna. Vitória would be the daughter of the serpent – due to the fact that Jeronimo found her in the river after the experience with the Mãe-d'Água and the bird Acauã, whose song signals bad omen. Inglês de Souza's fantastic narrative manages to make the connection between legends from different and distant cultures, uniting elements of Greek mythology and Amazonian culture.

Loureiro (2015a, p. 239) emphasizes that each river or lake has its Mother, who is represented by a merciless and giant serpent. During the night, men can only visualize two circles of fire illuminating the darkness. Such eyes become a stained glass window of the imaginary symbolizing the transcendence and coexistence of the material and the supernatural realm, between the rational and the irrational. Thus, the Boiuna is an example of the aesthetic character of the Amazonian theogony.

FINAL CONSIDERATIONS

The Amazon has a strong intangible cultural heritage. The riverside dweller lives with this imaginary, revealing a cosmic affectivity and promoting the aestheticizing conversion of his own experience into signs, a process of cosmo-allegory as a precious archive and essence of an unparalleled culture coming from his ancestors. Among the artistic expressions from this region there is a large collection to be explored by the study of literature regarding mythopoetics, so the expansion of research on myths and legends is necessary and inexhaustible.

The guiding thread of this research was the search for understanding the role of the river and its mythological aspects in the construction of the Amazonian literary identity, focusing on literary publications written by authors who discuss themes of this region and who use the myths and legends related to the river and its entities as a source of inspiration and element of the text. For this, we mainly used concepts worked by Loureiro on the Amazonian imaginary, in addition to the studies of Câmara Cascudo on Brazilian folklore and other authors.

In view of this, through this work, we pointed out, in the first place, the conceptions about the historical context of the Amazon, its transformations in relation to the imaginary and identity, such as the conceptual distinction between myths and legends, the symbolic implications of the river and notes on the fantastic in this literature. In addition, the beings of the Amazonian aquatic universe were explored in the works of regional or non-regional literati (such as Raul Bopp), in order to serve as a basis for literary discussion, using comparative reading to establish relationships between these authors regarding the issues of river mythology, while we also resorted to scholars of regional literature and other areas of knowledge to broaden theoretical perspectives.

Regarding Amazonian myths and legends, research on the Boto, the Iara, the Cobra Grande and other legends revealed, as a result, a multiplicity of aspects directly related to the river. The main aspects found in these tales are punishment, death and purification, multifaceted in their different versions.

In conclusion, the understanding of the symbolism of the waters, holder of different faces, within the mythical stained glass window of the Amazon River, as well as the realization of the research and exhibition of the main myths and legends of aquifers contained in the Amazonian

literature, in order to propose a brief cultural collection and investigate its origin, historical context and its constant transformation, with regard to the mythological elements related to the river.

Such narratives studied in this work brought the enchantment of the category of the fantastic in literature. With them, we can all find delight and a reason to escape from this chaotic and unflavorful world that surrounds us and calls us to reality, this one without the beauty of the mystery of Amazonian beings, Dolphins, Iaras, Big Snakes, today with crueler versions, with rivers polluted by human greed. If we value the Amazonian culture and the beings of the rivers and forests more, who knows, we may still be able to enjoy the power of this other universe, which is, at the same time, close and far from our heads still in great need of magic.

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Mild neurocognitive disorder and mood disorder: Possible relationships

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Lúrya Marcela Lopes Bertoluzzi Tassoni[1], Karina Kelly Borges[2] and Jayne Zaniratto[3]

ABSTRACT

Introduction. While depressive symptoms may represent a primary mood disorder, they may also reflect early signs of cognitive decline. Goal. To evaluate the possible relationships between Mild Neurocognitive Disorder (NLD) and Mood Disorder. Method. This is an exploratory, descriptive study with a quantitative approach, in which 19 medical records were analyzed with results of patients with a clinical diagnosis of TNL through clinical analysis data (medical consultations and laboratory tests and neuropsychological evaluation), between August 2018 and August 2019. The instruments used were a structured interview, Mini Mental State Examination (MMSE), Picture Memory Test (FMT), Semantic Verbal Fluency Test (Animal Category), Proverbs, Clock Drawing Test (TDR), Geriatric Depression Scale (GDS) and Geriatric Anxiety Inventory (GAI). Findings. Of the 19 patients, they had a mean age of 74.36±1.31 (66-88) years and a mean education of 2.26±0.37 (0-4) years. There was a significant correlation between the mean MMSE and RDT, Proverbs and GAI, thus showing the worse cognitive performance, worse results in metalanguage and greater anxiety symptoms. There was also significant evidence between GDS and GAI, showing correlation between symptoms and their severity, with clinical intensity for anxiety (M=12.00±1.14). Conclusion. Mood disorders suggest neurocognitive impairments, which may contribute to or aggravate symptoms related to TNL, such as impairments associated with memory.

Keywords: Depression, Mild Neurocognitive Disorder, Mood Disorder, Elderly.

[1] Psychologist, Post Graduate in Neuropsychology and Resident in Physical Rehabilitation
Educational institution: Faculty of Medicine of São José do Rio Preto
E-mail: lurya.bertoluzzi@gmail.com
[2] Doctor in Health Sciences and professor at the Faculty of Medicine of São José do Rio Preto
Educational institution: Faculty of Medicine of São José do Rio Preto
E-mail: karina.borges@famerp.br
[3] Psychologist, Post graduate in Health Psychology and Neuropsychology
Educational institution: Faculty of Medicine of São José do Rio Preto
E-mail: psicozanirattojayne@gmail.com

INTRODUCTION

In the elderly, there is speculation to understand the possible relationship between the decline in cognitive processes and Mood Disorder, two weaknesses intensely present in the lives of these individuals, and which are associated, especially depression, with higher mortality, regardless of the social context of the country (BHUI, 2019).

Mental disorders are created to designate a set of non-psychotic symptoms that are usually related to subclinical conditions of anxiety, depression, stress, insomnia, fatigue, irritability, forgetfulness, difficulty concentrating and somatic complaints that designate situations of mental suffering, which due to their high prevalence are considered one of the greatest public health problems worldwide (MURCHO et al., 2016).

Mood disorders refer to disorders that provoke a depressive reaction, impairing mental functioning. Depression, anxiety, fear, delusions, and apathy are examples of non-cognitive mental state disorders (SOARES et al., 2012). In the elderly, depression has been characterized as several etiopathogenic clinical aspects. It is usually associated with functional and structural problems of the brain, increasing the risk of clinical morbidity and mortality, if left untreated (STELLA et al., 2002).

The diagnosis of depression goes through some steps such as; general clinical examination, detailed psychiatric examination, anamnesis with the patient, family members and caregivers, neurological evaluation and occupational and neuroimaging examinations. These are essential procedures for diagnosis. Depression in the elderly is usually accompanied by other complaints, in addition to the common ones, such as hypochondriasis, low self-esteem, sleep and appetite alterations, feelings of worthlessness, dysphoric mood, paranoid ideation and recurrent thoughts of suicide (STELLA et al., 2002). In addition, depression in patients with cognitive impairments is associated with several complications, such as progression of cognitive decline, exacerbation of physically aggressive behavior, decreased activities of daily living and decreased quality of life, increased risk of institutionalization, and mortality (KUBO et al., 2019).

From a biochemical point of view, depression is associated with elevated cortisol levels, and may be another explanatory hypothesis that takes into account the possibility of this hypercortisolemia leading to the death of neurons in the hippocampus and consequent cognitive decline. Although there is a frequent association between the presence of depression and cognitive dysfunction, there is the possibility that there is no causal relationship between the two, that is, there may be only two comorbid presenting diseases (STEIBEL; ALMEIDA, 2010).

Cognitive functions are important factors in the evaluations of quality of life in senescence, and their decline contributes to the increase in dependence in the elderly. The appearance of mild forgetfulness in daily life can evolve into mild neurocognitive disorder, which consists of a transitory state between normal and pathological cognitive aging, in which the elderly person has cognitive loss

greater than expected for their age. This clinical condition does not meet the criteria for Alzheimer's Disease (AD), although it is a predictor in the identification of people at increased risk of developing it, and it is necessary to have an evaluation and follow-up of the current clinical picture for better definition and treatment direction (DA PENHA SOBRAL; CARRÉRA; DE ARAÚJO, 2015).

Just as there is a risk of developing dementia, there is a risk that the TNL will have comorbidity with depressive symptoms. Several studies show greater susceptibility of the elderly to the progression of diseases, such as pathologies such as depression, which can lead to the development of TNL and dementia or coexist with the disease (GALHARDO; MARIOSA; TAKATA, 2010). TNL includes complaints about impairment in other cognitive domains, in addition to memory-restricted complaints, but it is important that the diagnosis of dementia is excluded, and functionality preserved. Cognitive decline is identified from clinical evaluation or through neuropsychological tests, with a performance lower than expected for age and education (LEAL, 2020).

In the elderly, neuropsychological evaluation is of paramount importance when there are complaints of cognitive deficits, because memory problems, such as mild forgetfulness present in TNL, make it difficult to differentiate between dementia processes and depressive pseudodementia, since major depression can lead to similar cognitive deficits in mild cognitive impairment (SOARES et al., 2012; STELLA et al., 2002).

A relevant factor that may relate the link between mild cognitive impairment and depression is the fact that this is considered a biochemical disorder in the brain, characterized by the decrease in the hormone serotonin, which is responsible for balancing the mood level. The decrease in serotonin consequently generates an increase in cortisol, which contributes to the death of neurons in the hippocampus (GALHARDO; MARIOSA; TAKATA, 2010). Depression can be a stimulus to damage neuropathological processes in the brain, for example, through changes in the nervous, vascular and inflammatory systems. Episodes of severe depression have previously been associated with pathological changes in specific regions of the brain. The symptoms of depression can also be a psychological reaction to cognitive and functional decline or reflect a prodromal state of dementia (JOHANSSON et al., 2019).

In fact, depression, mild neurocognitive disorder (NLD) and dementia are frequently diagnosed in the elderly population and, in fact, depression may reflect an increase in the development of NLT. It is understood that depression is an event that causes extremely unsatisfactory symptoms for individuals who are affected by it, bringing with it changes in social life, affecting relationships and producing suicidal ideations, generating great damage to mental health (POZZOLI; DE CARLO; MADONNA, 2019).

The objective of this study was to evaluate the possible relationships between Mild Neurocognitive Disorder and Mood Disorder, as well as to analyze the data from the neuropsychological assessment and correlate it with depressive and anxious symptoms. To correlate demographic data with neuropsychological assessment findings and verify the prevalence of depression and anxiety symptoms.

METHODOLOGY

SAMPLE

This study is part of a parent project submitted to the Research Ethics Committee of the Medical School of São José do Rio Preto (CEP/FAMERP), CAAE: 93761118.0.0000.5415.

Analysis of 19 medical records of elderly patients, over 60 years old, who underwent Neuropsychological Assessment and clinical consultations at the Geriatrics and Neurogeriatrics Outpatient Clinics, between August 2018 and August 2019 and received a nosological diagnosis of Mild Neurocognitive Disorder. The inclusion criteria were: complete medical records with demographic and neuropsychological data information.

PROCEDURES

The following instruments were used: Brief Battery of Cognitive Screening, structured interview and the ICF – Informed Consent Form.

The Brief Battery of Cognitive Screening (NITRINI et al., 2004; VITIELLO et al., 2007) is composed of the following tests: Mini Mental State Examination (MMSE), Figure Memory Test (FMT), Semantic Verbal Fluency Test (Animal Category), Proverbs, Clock Drawing Test (RDT), Geriatric Depression Scale (GDS) and Geriatric Anxiety Inventory (GAI).

The Mini Mental State Examination (MMSE) is a measure with 30 items, of quick and brief application, which tracks the impairment of cognitive functions, assessing temporal and spatial orientation, immediate memory and word recall, calculation, naming, repetition, execution of a command, reading, writing (elaboration of a sentence) and visual-motor ability (copying of a drawing). The cut-off scores depend on the level of education, illiterate - 17 points, 1 to 4 years - 22 points, 5 to 8 years - 24 points, 9 or more - 26 points (BRUCKI et al., 2003; DE MELO; BARBOSA; NERI, 2017).

The Picture Memory Test (MPT) is a mini-battery that obtains five measures related to memory (incidental memory, immediate memory, learning, delayed memory and recognition). A sheet of paper with 10 drawings of concrete figures is presented and the individual is asked to name them. Then, the sheet is removed and he is asked to say which figures were on the sheet, allowing a time of one minute for recall. The sheet is then re-presented, with the instruction that the items be

memorized by the individual. After 30 seconds, the sheet is removed again, and the figures shown are asked to be mentioned (time of one minute). This procedure is repeated once again, with the instruction that a souvenir will be requested after a break. Two other tests are applied in this period (verbal fluency – animals and TDR – Clock Drawing Test). After about five minutes, in which these two tests are performed, the examiner asks the individual to evoke the figures previously presented, without the sheet being represented, offering one minute for evocation. After this, we present a sheet with 20 figures, which contains the 10 figures previously shown and 10 other figures, and the patient must recognize which figures he had already seen (VITIELLO et al., 2007). In naming, the cutoff point is 10, that is, when making a mistake by one figure or more, the participant is classified as inferior. In immediate memory, the cut-off point used is 5, learning 7, delayed memory 6 and recognition 9 (NITRINI et al., 2004; NITRINI et al., 1994).

The Semantic Verbal Fluency Test evaluates various cognitive skills, such as language, semantic memory, and executive function. When performing the test, the examiner asks the participant to speak as many animals as he remembers in a short period of time of 1 minute. Responses are scored, but repetitions are not considered. The cutoff point is made according to schooling, for illiterate people - 9 points, 1 to 8 years - 12 points and over 9 years - 13 points (Chagas, 2020; Montiel et al., 2014).

The Clock Design Test (RDT), according to Chagas (2020) is used to verify the existence of impairments in some cognitive abilities such as visuospatial functions, visuoconstructive, semantic memory, symbolic and graphomotor representation, and executive functions. To apply the test, the participant is given a blank sheet of paper and a pencil, then the participant is asked to draw a clock with all the numbers inside, then the clock is asked to draw the time of 2h 45min. The criterion used for correction is the Shulman scale, which presents a criterion of 0 to 5 points, regarding the quality of the watch and that its cut-off score is equal to 3 (Chagas, 2020; Montiel et al., 2014).

The Geriatric Depression Scale (GDS) aims to investigate the occurrence of depressive symptoms in the elderly. This instrument consists of a questionnaire of 15 questions with "yes" or "no" answers. The scores range from 0 to 15, with a cut-off score greater than 5 indicative of the presence of depression (Maximiano-Barreto; De Oliveira Fermoselei, 2017).

The Geriatric Anxiety Inventory (GAI) is used to assess the severity of the most common symptoms of anxiety in the elderly. And it consists of 20 items with a dichotomous answer "agree" or "disagree". The total number of answers "I agree" being greater than 10 characterizes the individual with signs of anxiety (Maximiano-Barreto; De Oliveira Fermoselei, 2017).

Proverbs evaluates semantic memory and abstract thought. The individual is presented with two proverbs, asking him to say their meaning (Sé, 2011).

The structured interview will consist of questions related to name, age, gender, education, profession, time of complaint and main complaint.

RESULTS

Of this sample, a total of 19 medical records, referring to the sociodemographic questionnaire addressed in Table 01, shows that 63.2% were female, with a mean age of 74.36±1.31 (66-88) years and a mean schooling of 2.26±0.37 (0-4) years. 52.6% were housewives and 42.1% had complaints of forgetfulness for 24 months.

Table 01. Sample demographics

Variable		N	%
Sex	Female	12	63,2
	Male	7	36,8
Years of schooling	0	5	26,3
	2	6	31,6
	3	1	5,3
	4	7	36,8
Profession	From Home	10	52,6
	Rural worker Bricklayer/Driver/Caregiver/Porter/Salesperson/Civil Servant	3 1	15,8 5,3
Complaint Time	5 months	1	5,3
	7 months	1	5,3
	12 months	5	26,3
	18 months	2	10,5
	24 months	8	42,1
	36 months	1	5,3
	60 months	1	5,3
Main complaint	Oblivion	19	100

Source: Prepared by the authors.

Regarding cognitive data, the mean MMSE score was 21.78±3.77 points for the 19 participants. Subdividing in relation to the cutoff point related to education, there were (n=5) illiterate people, with a mean of 21±2.54. Patients with up to 4 years of schooling showed a mean of 24.87±2.74, resulting in 8 patients, and a mean of 18.33±2.33, resulting in 6 patients, with an overall mean of 22.07±4,17, resulting in 14 participants.

Data related to the Visual Memory Test, in nomination, 15 participants obtained 10 points in the task. More than one error is suggestive of naming disorder or visual perception, related to the 4 patients who were unable to correctly name all the figures. Table 2 shows a breakdown of the results

of each stage, such as the activity of naming, immediate memory, learning, delayed memory and recognition. The results include the distribution of performance.

Table 02. Visual Memory Activity Results - CERAD

Activity	Average	Standard deviation	N	%	Punctuation	Classification
Nomination	9,78	0,41	15	78,9	10	Average
			4	21,1	< 10	Inferior
Immediate Memory	6,89	1,55	18	94,7	≥ 5	Average
			1	5,3	< 5	Inferior
Learning	7,26	1,62	12	63,2	≥ 7	Average
			7	36,8	< 7	Inferior
Late memory	6,26	1,99	12	63,2	≥ 6	Average
			7	36,8	< 6	Inferior
Recognition	9,42	0,76	16	84,2	≥ 9	Average
			3	15,8	< 9	Inferior

Source: Prepared by the authors.

When the language construct was verified, the neuropsychological assessment data showed that n=12 (63.2%) patients obtained a lower classification in the domains related to semantic verbal fluency and only n=7 (36.8%) with average performance. In activities that evaluated metalanguage, it was observed that n=9 (47.4%) patients had lower performance and n=10 (52.6%) had average performance. This shows that 55.26% of the patients showed impairments in the language construct.

In the cognitive domain that assesses executive functions and visuospatial skills, n=17 (89.5%) of the participants scored 3 points or less. This is equivalent to how committed this sample is in relation to these domains. Table 3 shows the number of participants and their performance in relation to the constructive domains (points) of performance.

Table 03. Data regarding the Clock Design Test.

Clock Design Test			
Participants	**Stitches**	**%**	**Classification**
3	0	15,8	inferior
8	1	42,1	inferior
2	2	10,5	inferior
4	3	21,1	inferior
1	4	5,3	average
1	5	5,3	average

Source: Prepared by the authors.

When the values of the mood scales aimed at the elderly population were computed, the GDS showed that n=10 (52.6%) of the participants showed evidence of depressive symptoms and in the GAI scale n=11 (57.9%) of the participants showed symptoms of anxiety. This shows that 55.26% of the patients had symptoms of mood disorder.

DISCUSSION

The study indicates a higher proportion of females (63.2%), which is also found in another study21. These data can be understood by the greater care and demand for health services by women and may also be related to the higher life expectancy of women compared to men (Costa et al., 2021).

The participants had a mean age of 74.36±1.31 (66-88) years and a mean education of 2.26±0.37 (0-4) years. Corroborating the literature that points out that Brazilians over 60 years of age have low levels of education (Dias, 2020). With advancing years, not only do physical functions decrease, but cognitive functions also change, concluding that memory complaints should be considered an important factor that causes impairment in the elderly and, sometimes, may indicate early dementia, despite normal scores in simple screening tests (O'Brien et al., 1992).

Regarding work activities, there was a predominance of Household Workers with 52.6%, followed by Rural Workers with 15.8% and others with 5.3% each. However, all participants are retired, and therefore do not practice the work activities they have developed throughout their lives.

Regarding the duration of complaint, the patient had a mean age of 1.73 years ±0.23, with forgetfulness as the main complaint, which is confirmed by the literature, which shows that one of the criteria that frequently appears in neuropsychological evaluations are complaints related to memory deficits (Gil; Busse, 2009). However, the subjective perception of memory loss has a low predictive value for the diagnosis of dementia, since it does not correspond to the objective impairment of function, generally reflecting the affective state of the patients and not necessarily the cognitive decline (Charchat-Fichman et al., 2005).

The results found through the MMSE showed that the average was 21.76 points, results that are similar to the average of another study focused on the elderly community (Costa et al., 2021). It is important to emphasize that the application of the MMSE in Brazil faces some obstacles, such as heterogeneity and the presence of some items for the assessment of cognitive dysfunctions that require formal education, which ends up becoming an obstacle for elderly Brazilians, since there are high rates of low education in this community. In addition, there are problems due to the way, based on only one question, how the MMSE evaluates certain cognitive functions, such as working memory. Such a problem can generate dubious results. Despite this, the application of the MMSE in Brazil has been very relevant for studies and research (Silva et al., 2020).

The RDT presented a mean of 1.73±0.32 points, with 89.5% of the participants presenting lower performance, and a moderate correlation was observed associated with MMSE performance in relation to RDT, since the lower the performance in the MMSE, the lower the performance in the RDT, with a value of p (0.012). This result is in line with the literature, as in one study significant correlations were also found between the MMSE, the RDT and other instruments used (Chagas, 2020).

In the Proverbs test, the mean was 1.26±0.2, with a moderate correlation with the MMSE, the lower the performance in the MMSE, the lower the performance in Proverbs, with a value of p (0.04). Some studies corroborate this result, explaining that such variables may also be related to years of schooling. The fewer years of schooling, the worse the performance in the MMSE and the worse the performance in Proverbs. Therefore, deficits in general cognition and metalanguage tend to worsen with age (Wachholz; Yassuda, 2011).

Regarding the affective functions assessed by the Geriatric Depression Scale, there is a correlation between performances, the worse performance in GDS, the worse performance in GAI, with a value of p (0.02). The IAB also correlated with the MMSE, with a value of p (0.03). The greater the presence of anxious symptoms, the lower the MMSE score. As the literature points out, depression and anxiety are proportionally associated with cognitive decline, making it necessary to evaluate demographic and clinical determinants so that there are strategies for prevention and intervention of cognitive impairments and dementia, through a deepening of neuropsychological assessment (Amorim; Pereira, 2020).

Also in relation to the GAI, an association was noted with the years of schooling, the more years of schooling, the lower the score on the GAI, corroborating results in the literature, such as in a study where a relationship was found between the variables years of schooling with a higher prevalence of anxiety disorders. The group studied with the highest prevalence of anxiety disorders was the one with the fewest years of schooling (Costa et al., 2019).

According to the literature, the interference of the level of education and its impacts are not only related to psychiatric or psychopathological disorders; but it can also have consequences related to difficulty in accessing health, decreased quality of life, difficulty in handling medications, and other factors that can characterize aspects that drive anxiety and depression in this population (Maximiano-Barreto; De Oliveira Fermoselei, 2017).

The literature hypothesizes about the impact of depression on cognitive decline. The correlated symptoms not only refer to the level of affect, but also influence cognition, triggering signs of anhedonia, wandering, sleep disturbances, and mood swings. In addition, depression causes damage to the life of the elderly, because in addition to causing isolation, it decreases memory capacity, causing learning difficulties and changes in various cognitive functions. Fatigue and tiredness related to depression can cause impairment in the performance of several cognitive functions, and especially memory (Silva, 2020).

CONCLUSION

Through this study, it is concluded that depression causes neurocognitive impairments, which can contribute to or aggravate symptoms related to TNL, such as impairments associated with memory. However, there are not enough studies to prove the total link between depression and TNL. A correlation with depression and dementia is noted as ratified by the literature, but with TNL there are still many uncertainties to be explored and solved through further studies and research.

In order to have a real knowledge about the cognitive and behavioral characteristics of individuals suffering from depression and TNL, it is essential to understand and interpret the performance in the execution of daily activities and the implication that these diseases can have on the lives of these individuals. Thus, it is essential to conduct further research using screening instruments, since these are relevant to assess cognitive functions and detect possible impairments in them.

Finally, it is important to identify and understand the individual's neuropsychological profile and mood, as this makes it possible to develop intervention strategies to contribute to the alleviation of suffering and the damage caused. Consequently, providing the contribution to new methods of neuropsychological assessment.

With the study, there is a scarcity of research aimed at in-depth knowledge regarding depression and possible associations with TNL, so it is necessary to continue research and invest in new ones, so that it is possible to identify possible relationships, better understand the clinical and neuropsychological picture, and then develop interventions that contribute to improving the quality of life of these individuals.

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Psychopathology and social media: Social media triggers in the development of mental disorders

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Carlos Henrique Barbosa Rozeira[1], Marcos Fernandes da Silva[2], Aline Ribeiro de Cnop Lemos[3], Ana Julia Milholo Robles[4], Arthur Ricardo Dias[5], Célio Honório Lopes Júnior[6], Damiana Pereira da Silva Neves[7], Izabella Macedo Rodrigues[8], Lívia Ayummi Cocchiararo Fraga Bernardes[9], Monica Gomes Lirio Pimentel[10], Monique Goulart Domingues[11] and Rony Anderson Matos Modesto[12]

ABSTRACT

In the digital age, social networks have become an extension of our existence, shaping interactions and influencing behaviors. This article investigates the impacts of this digital revolution on mental health, examining how excessive use of platforms such as Instagram, Facebook, Twitter, and YouTube can trigger mental disorders. The research explores the triggers present in social networks that foster psychological problems, such as anxiety, depression, attention deficit hyperactivity disorder (ADHD) and digital addiction. However, it is essential to recognize that social networks, when well used, can have a positive character, facilitating the connection between people, promoting access to information and offering emotional support. Based on a literature review of relevant studies, this work synthesizes the existing knowledge about the relationship between the use of social networks and mental health, addressing the effects of algorithms, social comparison, and exposure to idealized content. In addition, the implications of these findings for clinical practice and the prevention of mental disorders are discussed, emphasizing the importance of educational interventions, public policies, and digital hygiene strategies. The methodology involved a critical analysis of selected articles through specific descriptors on platforms such as Google Scholar, Scopus and Web of Science. This study aims to contribute to the understanding of the negative effects of social networks and promote a healthier use of these platforms.

[1] Psychologist, Postgraduate in Psychopathology, Psychodiagnosis, Psychological Assessment and Cognitive Behavioral Therapy, Master in Teaching from the Fluminense Federal University (UFF).
E-mail: ariezor@hotmail.com
[2] Nurse, Graduating in Medicine from Faculdade Metropolitana São Carlos (FAMESC), Postgraduate in Health Auditing and Intensive Care.
E-mail: marco_s_silva@hotmail.com
[3] Physiotherapist, Undergraduate student in Clinical Nutrition at Iguaçu University (Unig).
E-mail: alinecnop@yahoo.com.br
[4] Undergraduate student in medicine at Faculdade Metropolitana São Carlos (FAMESC).
E-mail: anajuliamrobles@gmail.com
[5] Graduating in Medicine from AFYA Faculty of Medical Sciences of Bragança (AFYA Bragança).
E-mail: arthur.ricardo.days@gmail.com
[6] Doctor, Graduated in Medicine from the University of Athens (UNIATENAS).
E-mail: celiojunior1998@outlook.com
[7] Nurse, Undergraduate student in Medicine at Iguaçu University (UNIG).
E-mail: daminevess@gmail.com
[8] Undergraduate student in Nursing at UniRedentor – AFYA.
E-mail: izabellamrodrigues2001@gmail.com
[9] Undergraduate student in Psychology at Faculdade Metropolitana São Carlos (FAMESC).
E-mail: liviaayume@outlook.com
[10] Nurse, Bachelor's and Licentiate Degree in Nursing from Salgado de Oliveira University. Undergraduate student in Psychology at Estácio de Sá University.
E-mail: monicagomeslp@gmail.com
[11] Dental Surgeon, Undergraduate student in Medicine at the University of Grande Rio Prof. José de Souza Herdy.
E-mail: nick.goulart@icloud.com
[12] Physiotherapist Postgraduate in Osteopathy at the School of Osteopathy Madrid.
E-mail: rony.mmodesto@gmail.com

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INTRODUCTION

With the advance of globalization and the ease of access to technologies, the boundaries between societies have become narrower. Today, anyone with access to the internet can connect with individuals from any part of the world instantly. In this context, social networks have emerged as platforms for global connection, allowing the exchange of experiences and the expansion of knowledge. However, these platforms also bring with them negative impacts, especially regarding mental health (Unicef, 2022).

The digital revolution, at its core, refers to the integration and mastery of digital technologies in all areas of human society. From the dawn of the information age, marked by the advent of personal computers and the internet, to the current explosion of mobile devices, the Internet of Things (IoT), and Artificial Intelligence, we have witnessed a series of historical milestones that have shaped our reality. These milestones are not only technological evolutions, but milestones of change in the way we live, work, and relate to each other (Batista, 2024).

One of the most recurring clichés about the digital revolution is that it has plunged us into an "era of change". However, this is even more fascinating: we are living through a significant "change of era". Changes of era are, by definition, distinct. They shake up reality, reconfigure the role of institutions in our minds, and are profoundly emancipatory periods. These moments do not come suddenly, but are established through slow and silent transformations in our behavior. Its impacts permeate social, political, economic, and cultural life, often accompanied by significant technological advances (Camargo, 2015).

An example of this is the change of era that occurred at the end of the 19th century, driven by innovations such as the steam engine. Its effects included urbanization, the massification of education, the popularization of the press, and the universalization of the vote. Many of these effects persist to this day, although some are showing signs of wear and tear due to the digital revolution shaping our current change of era. This new revolution brings to light political movements in social networks, intense conflicts of interest in regulated sectors, such as urban mobility (exemplified by Uber) and telecommunications (exemplified by WhatsApp), in addition to the rapid integration of instant access between people, information, products and services in our daily lives (Camargo, 2015).

While technology connects people regardless of physical borders, it also creates an ongoing sense of "disconnection." With a screen connected to the internet, the world around loses brightness and the attention that would be due to it is no longer the same (Fernandes, 2018). This paradox, amplified by the use of social media, underscores the need to balance digital life and genuine personal interaction, seeking ways to maintain mindfulness and presence in everyday moments. However, more than a technological panacea, what is on the horizon is the outline of our future behavior in relation to personal care.

The logic of social networks, based on algorithms that select content according to user behavior, creates bubble filters that limit the diversity of opinions and encourage reactions to extreme positions. This mechanism contributes to the spread of hate speech, negatively affecting the emotional development of adolescents and young people. In addition, complex topics such as mental health are often treated superficially on social networks, leading to the trivialization of psychopathologies (Unicef, 2022).

Obviously, it is not possible to detail all the changes in behavior, but we can already be sure that social networks awaken triggers that can develop mental disorders. In this context, this study aims to analyze the relationship between the use of social networks and the development of mental disorders, to identify the specific triggers present in social networks that contribute to psychological problems, and to discuss the implications of these findings for clinical practice and the prevention of mental disorders.

METHODOLOGY

Considering the guidelines of Cervo, Bervian and Silva (2007), the present study is categorized as a basic and theoretical research, with the objective of expanding scientific knowledge about the impact of social networks on mental health. This is an exploratory research of a qualitative nature, based on concepts and information extracted from the scientific literature.

This literature review involved a critical and synthetic analysis of relevant studies published on the subject. Using academic and scientific electronic platforms, such as Google Scholar, Scopus and Web of Science, specific terms were used in the search, such as "social networks", "mental health", "mental disorders" and "digital addiction".

To select the studies, specific inclusion and exclusion criteria were established. Articles that addressed aspects related to the impact of social networks on mental health and were available in Portuguese and English were included. Articles without a clear or relevant approach were excluded, as well as those not available in digital format or in languages understandable to the research team.

To elucidate complex issues present in the text, we resorted to specific searches in the Google search engine. This method provided access to new sources of knowledge, following an approach based on scientific and epistemological principles. As emphasized by Rozeira et al. (2023), this methodology allows us to unravel the complexity and unpredictability inherent in scientific research. Each new concept unveiled represents an elemental piece in the incessant search for discernment. In summary, the assimilation of new concepts proved to be essential to strengthen the structure of this scientific study.

THE IMPACT OF SOCIAL MEDIA ON MENTAL HEALTH

The use of social media, such as Instagram, Facebook, Twitter, and YouTube, is a relatively recent phenomenon. We are still in the process of fully understanding the effects of this new form of social interaction on different populations. The increase in time devoted to these platforms has been linked to feelings of isolation from the real world, potentially contributing to the development of mental disorders. According to the Brazilian Institute of Geography and Statistics (IBGE), 70% of the Brazilian population has access to the internet. In addition, Brazil is the second country that occupies the most time per day on the internet, with an average of 9 hours and 29 minutes daily, of which 3 hours and 34 minutes are used on social media (Abjaude et al., 2020).

The type of content published and consumed on social media has a significant impact on mental health. Many publications reinforce narcissism, living standards, consumption, and status, which has contributed to the increase in the prevalence of various psychiatric disorders, including depressive symptoms, anxiety, and low self-esteem. Social networks present an idealized cut of reality. People often post photos and share memorable moments that are positive. Consuming this type of content in excess can lead to the impression that the lives of others are superior to our own, especially during periods of mental vulnerability. This exposure to faces, bodies, routines, jobs, travel, and perfect relationships can increase the feeling of personal devaluation, contributing to excessive self-demands and contributing to stress, demotivation, and self-deprecation (Abjaude et al., 2020).

Excessive use of social networks can alter the functioning of the brain, especially with regard to feel-good neurotransmitters. Constant stimuli and positive reinforcements, such as likes and comments, trigger the production of dopamine, a molecule associated with pleasure. This process occurs in an accelerated way and with little brain effort, which can reduce the ability to find pleasure in activities that require more energy, such as interactions in nature. Over time, the offline world's ability to generate pleasure or motivation may decrease (Unimed Campinas, 2024).

The negative effects of social networks are broad and diverse. Excessive use of social media can impair the functioning of the reward system, increasing the need for immediate gratification. This can hinder the ability to deal with frustrations and the need to wait. In addition, excessive stimuli, constant comparison with other people, and impairments in the sleep cycle can increase the risk of developing anxiety disorders. Social media addiction can hinder the maintenance of healthy interpersonal relationships in the offline world. People may miss out on opportunities to establish face-to-face contact or spend quality time disconnected. The unattainable beauty standards promoted on social media, often from edited and filtered photos, have a significant impact on self-esteem. This can lead to a loss of authenticity, eating disorders, and depression (Unimed Campinas, 2024).

In this context, we realize that the effects of social networks on mental health are multicausal and complex. While social media cannot be solely responsible for mental disorders, it is clear that they can act as significant triggers. Therefore, it is essential to approach the use of social networks in a conscious and balanced way, seeking to minimize their negative impacts while taking advantage of the benefits that these platforms can offer.

SOCIAL NETWORKS AND THE DEVELOPMENT OF MENTAL DISORDERS: EVIDENCE AND PERSPECTIVES

The relationship between the use of social networks and the development of mental disorders has become a widely explored field of research. Several scientific evidences suggest that, with a genetic predisposition, the excessive use of these platforms can significantly contribute to the emergence of conditions such as depression, anxiety, and attention deficit hyperactivity disorder (ADHD).

Recent studies indicate that intensive use of social networks is strongly associated with higher levels of loneliness, anxiety, and depression. Lin et al. (2016) found that individuals who spend more than two hours a day on social media are twice as likely to report mental health problems compared to those who use these platforms for less time. Corroborating this perspective, a report by the UK's Royal Society for Public Health, published in 2017, ranked Instagram as the most harmful platform for young people's mental health, followed by Snapchat, Facebook, and Twitter.

Several mechanisms are proposed to explain this relationship. Social comparison stands out as one of the main factors. The phenomenon of comparing one's own life to the seemingly perfect lives projected on social media can lead to feelings of inadequacy and low self-esteem. A study by Vogel et al. (2014) highlighted that the use of social networks intensifies self-comparison and rumination, contributing to the development of depressive symptoms.

In addition, studies in neuroscience have shown that excessive use of social networks can alter brain functioning. Research using functional magnetic resonance imaging (fMRI) reveals that positive feedback on social media, such as likes and comments, activates the brain's reward centers, releasing dopamine. Montag et al. (2017) indicate that this release of dopamine is similar to that observed in responses to addictive activities, such as gambling and substance use, suggesting that the use of social networks can create a cycle of addiction with negative impacts on mental health.

The use of social networks is also strongly linked to the increase in anxiety disorders. Primack et al. (2017) found that individuals who use multiple social media platforms are three times more likely to develop anxiety symptoms compared to those who use only one or two platforms. The constant need to be up-to-date and respond quickly can generate a feeling of continuous pressure, exacerbating anxiety symptoms.

Another relevant aspect is the interruption of sleep. The use of social networks, especially before bed, is associated with sleep problems. The blue light emitted by mobile devices interferes with the production of melatonin, the hormone responsible for sleep, leading to sleep disorders and, consequently, a negative impact on mental health. Levenson et al. (2017) revealed that adolescents who use social networks excessively have a higher risk of developing sleep problems, which are directly linked to increased symptoms of depression and anxiety.

Recognizing the negative impact of social networks on mental health, several interventions have been proposed. The promotion of "digital hygiene", which includes regular breaks in the use of social networks, the limitation of screen time and the practice of offline activities, is recommended by mental health experts. In addition, public policies aimed at education on the healthy use of social networks and the inclusion of digital education subjects in schools emerge as promising strategies to mitigate the negative effects of these platforms on mental health.

The way social networks are used also adds to this context. Verduyn et al. (2015) differentiated between passive use (browsing without interaction) and active use (interacting and posting content). The results indicated that passive use of social media is associated with an increase in depressive symptoms, while active use may in some cases have neutral or even positive effects on mental health. Additionally, the amount of time spent on social media is a critical factor. Twenge, Joiner, Rogers, and Martin (2018) found a correlation between excessive time spent on social media and increased rates of depression and suicide among adolescents. They suggest that more than five hours a day on social media is associated with a significant increase in the risk of depression and suicidal behaviors.

SPECIFIC TRIGGERS PRESENT ON SOCIAL NETWORKS THAT CONTRIBUTE TO PSYCHOLOGICAL PROBLEMS

The influence of social networks on mental health is a complex and comprehensive phenomenon, marked by the presence of several specific triggers that can intensify psychological problems. Among these triggers, social comparison, cyberbullying, the culture of immediacy, misinformation, and cancel culture emerge as factors that negatively impact psychological well-being.

Social comparison is one of the most prevalent and disturbing mechanisms in social media. Festinger (1954) formulated the theory of social comparison, which posits that individuals evaluate their own worth based on comparison with others. Constant exposure to idealized images of success and happiness can lead to deep feelings of inadequacy and low self-esteem. Fardouly et al. (2015) corroborate this perspective, showing that comparison with unrealistic standards of beauty on social

networks is associated with eating disorders and body dissatisfaction, especially among young women.

Another significant trigger is cyberbullying. Cyberbullying, defined as virtual harassment, is a form of violence that occurs over the internet, encompassing social networks, message groups, and online gaming platforms. It is characterized by repetitive behaviors that aim to humiliate, persecute, intimidate, assault or defame someone. This type of violence has a significant impact on the mental health of young people, as revealed by several studies (Olweus; Limber, 2018).

According to a survey conducted by Unicef, one in three young people in at least 30 countries reported being a victim of cyberbullying. In addition, approximately one in five young people dropped out of school after experiencing cyberbullying (Unicef, 2019). The organization's U-Report points out that social networks are the main places where these episodes occur.

The Unicef survey, which interviewed more than 170 thousand young people from different countries, including Brazil, shows that cyberbullying is a global problem, affecting young people from different cultures in a similar way. In Brazil, 37% of adolescents reported having been victims of cyberbullying, and 36% said they had missed school after suffering violence in the virtual environment. These numbers highlight Brazil as one of the countries with the highest incidence of cyberbullying among young people (Unicef, 2019).

One notable aspect of the study is young people's perception of who should be responsible for tackling cyberbullying. Among those interviewed, 32% believe that the responsibility lies with the government, 31% consider that young people themselves should act against the problem, while 29% think that the companies that own social media platforms, such as Facebook, Instagram and Twitter, should be the main responsible. Thus, it becomes obvious that social networks have become a breeding ground for harmful behaviors such as sending threatening messages and public humiliation.

Tokunaga (2010) demonstrates that victims of cyberbullying face a notable increase in symptoms of depression and anxiety, exacerbated by the public and persistent nature of digital attacks. Hinduja and Patchin (2018) reinforce this view, associating the experience of cyberbullying with an increase in social isolation and suicidal thoughts among adolescents, highlighting the devastating impact of online harassment.

Suicide is an extremely sensitive topic, often associated with the phenomenon of cyberbullying. Cyberharassment can be even more impactful than traditional bullying due to its reach and the permanence of exposure on the internet, which can lead the victim to make extreme decisions.

The power of exposure provided by the internet allows attacks to be widely publicized and difficult to forget, exacerbating the victim's feelings of shame, humiliation and failure. This constant

remembrance and visibility of the attacks can intensify emotional distress, leading some victims to consider suicide as a way out.

Overall, suicide can be a reaction to the overwhelming feelings of despair and powerlessness that result from cyberbullying. The impossibility of reversing the consequences of online exposure can make the victim see suicide as the only viable solution to escape the pain and continuous humiliation. The psychological impact of cyberbullying is profound and long-lasting, highlighting the urgent need for effective interventions to prevent such tragedies (Olweus; Limber, 2018).

The culture of immediacy on social networks, characterized by the pressure to always be connected and available, also contributes to psychological problems. The phenomenon of "Fear of Missing Out" (FOMO), described by Przybylski et al. (2013), illustrates how the constant need to keep up to date with other people's events and activities can generate stress and anxiety. The pressure to respond quickly and the worry that you might miss out on important experiences create a state of digital hypervigilance, which can lead to feelings of overwhelm and exhaustion.

In the professional context, FOMO can manifest itself as the habit of constantly monitoring workgroup messages and notifications, even outside working hours. This behavior interferes with moments of leisure, which are important for resting the body and mind and for stimulating creativity. As recent studies point out, the need to always be connected to work can lead to mental and physical exhaustion, reducing productivity and increasing the risk of stress-related disorders (Smith et al., 2019).

In personal life, FOMO is related to the perception that other people are having more satisfying experiences, which generates a compulsion to constantly check for updates on social media (Pagno, 2023). This continuous comparison can negatively affect self-esteem, leading to feelings of inadequacy and dissatisfaction with one's life (Thompson & Lougheed, 2012). The popular saying "the grass is always greener on the other side" illustrates this distorted perception well.

Neurologically, the behavior associated with FOMO activates the release of dopamine in two areas of the brain. In the central region, dopamine provides a feeling of pleasure; in the prefrontal area, it influences impulse control and behavior. These mechanisms explain why constantly checking notifications can generate a temporary feeling of satisfaction, followed by a continuous desire for more stimuli (Pagno, 2023).

Incessant checking of notifications and the exaggerated use of social networks are associated with several mental disorders, including anxiety, attention deficit and stress. In addition, they can lead to digital addiction, a state in which the individual feels the constant need to be connected. In severe cases, this dependence can progress to more serious conditions, such as Burnout Syndrome or Attention Deficit Disorder (ADD). Pagno (2023) highlights that "the person feels overstimulated all

the time, cannot rest" and observes an increase in the prevalence of concentration difficulties among patients.

Another factor to consider is the impact of the content consumed. The consumption of negative content or fake news can amplify feelings of fear, anxiety, and despair. Garrett (2019) noted that frequent exposure to negative news and false information on social media is associated with a significant increase in anxiety and stress levels among users. The spread of misinformation, especially during crises such as the COVID-19 pandemic, has exacerbated stress and feelings of insecurity among users, as evidenced by Pennycook et al. (2020). The confusion generated by contradictory and alarmist news contributes to a continuous state of anxiety and fear.

Cancel culture, a growing phenomenon on social media, also stands out as a major trigger. The practice of publicly denouncing and shunning individuals can have severe psychological consequences. Clark (2020) notes that people targeted by cancellation campaigns face a significant increase in stress, anxiety, and depression, a result of exposure to public criticism and humiliation. This virtual environment, where private issues become public spectacles, amplifies the emotional and psychological impact on affected individuals.

CLINICAL PRACTICE AND THE PREVENTION OF MENTAL DISORDERS

The growing scientific evidence on the impact of social networks on mental health reveals significant implications for both clinical practice and strategies for the prevention of mental disorders. As the effects of social media on psychological health become more evident, there is a need to adapt therapeutic approaches and develop effective preventive interventions.

Recent findings on the influence of social networks provide new insights that can transform clinical practice. Recognition of the specific mechanisms by which social networks affect mental health allows for more precise targeting of therapeutic interventions.

Several studies point to Cognitive-Behavioral Therapy (CBT) as the most effective approach to help individuals who face the negative effects associated with the use of social networks. Studies show that CBT can be adapted to address issues related to social comparison and digital addiction, helping individuals develop a healthier relationship with digital platforms (Moukaddam & Shah, 2017). Integrating techniques that directly address the influence of social media on self-esteem and self-perception can significantly improve therapeutic outcomes. The personalization of treatment, taking into account the patient's digital profile, allows for an approach centered on individual needs.

In addition to therapeutic interventions, digital education and media literacy are important strategies to mitigate the negative effects of social networks. According to a Unicef report (2019), educational programs that teach children and adolescents about the safe and critical use of social networks can reduce the risks associated with excessive use and exposure to harmful content. These

programs can help cultivate a more balanced relationship with social media, promoting a safer and healthier digital environment.

Clinical practice should incorporate the assessment of patterns of social media use, given their impact on mental health. The literature suggests that social comparison and positive feedback on social media are strongly associated with depressive and anxious symptoms (Vogel et al., 2014; Montag et al., 2017). Incorporating questions about social media use and its emotional consequences into clinical assessments can provide a more complete understanding of the sources of stress and contribute to a more accurate diagnosis.

The intersection between social media use and anxiety disorders, as well as sleep problems, demands a clinical approach that includes strategies to improve sleep hygiene and anxiety management. Evidence indicates that the use of mobile devices before bed and the pressure to stay constantly connected are associated with sleep disturbances and an increase in anxiety symptoms (Primack et al., 2017; Levenson et al., 2017). Interventions that promote healthy sleep practices and relaxation techniques can be crucial in mitigating these adverse effects.

In light of the findings on the impacts of social media, a number of prevention strategies can be implemented to protect mental health, especially among young people, who are particularly vulnerable, as detailed in Box 01.

Chart 1: Strategies to Mitigate Digital Dependence

Strategy	Description
Set clear boundaries	Establish specific times to check emails and social networks, avoiding use outside these periods.
Establish a Usage Goal	Have a time limit to spend on social networks, taking care not to stay on them for too long.
Focus on Face-to-Face Life	Leave your cell phone away when you are talking, working, during meals or watching a movie, to enjoy the moment with 100% attention.
Practice offline activities	Engaging in hobbies and activities that do not involve the use of digital devices.
Turn off notifications	Limit push notifications to reduce ongoing disruption caused by alerts of new content.
Curate	Keep in your networks only pages and people that bring feelings of peace and tranquility and edifying content.
Have a critical sense	Remember that the networks only show a positive (and edited) cut of people's lives. Do not make comparisons taking what you see there as reality.

Source: The authors.

In addition to the strategies mentioned above, digital education and media literacy are essential for preventing the negative effects of social networks. According to the Unicef report (2019), the implementation of educational programs that teach children and adolescents about the safe and critical use of social networks can significantly reduce the risks associated with excessive

use. Teaching skills for discerning misinformation and managing social comparison can help cultivate a more balanced relationship with social media.

Promoting "digital hygiene" practices is essential to prevent mental disorders associated with excessive use of social networks. Setting clear boundaries for screen time and incorporating regular breaks can help maintain a healthy balance (Twenge et al., 2018). Education about the importance of offline time and the practice of alternative activities can be an effective strategy to reduce the negative impact of prolonged use of social networks.

THE INFLUENCE OF SOCIAL NETWORKS IN THE TRIVIALIZATION OF PSYCHOPATHOLOGIES

We have already seen that the growing use of social networks is inevitable and has had a great impact on the way psychopathologies are perceived and discussed. The ease with which information is shared on these platforms enables both the dissemination of knowledge and the spread of misinformation. In this scenario, technical terms and psychiatric diagnoses are often used inappropriately, contributing to the trivialization of mental disorders.

The logic of social networks, based on algorithms that select content according to user behavior, creates bubble filters that limit the diversity of opinions and encourage reactions to extreme positions. This mechanism contributes to the spread of hate speech, negatively affecting the emotional development of adolescents and young people. In addition, complex topics such as mental health are often treated superficially on social networks, leading to the trivialization of psychopathologies (Fernandes, 2018; Unicef, 2022).

The trivialization of mental disorders can be seen as an inappropriate appropriation of knowledge about them. Access to information, although positive, can lead to the inappropriate use of technical terms without proper context, resulting in their loss of meaning. In this way, experiences of psychological distress are trivialized and seen as common characteristics, ignoring the seriousness of mental disorders.

Examples of this trivialization are common on social networks, where expressions such as "I have OCD" or "I am depressed" are used lightly to describe organized behaviors or fleeting feelings of sadness. This trivialization makes it difficult to understand the severity of mental disorders, blurring the line between clinical symptoms and everyday experiences of anxiety or mood swings (Unicef, 2022).

The glamorization of certain mental disorders in movies, series, and social networks also contributes to risky behaviors, such as self-medication. The dissemination of distorted content on blogs and other platforms can romanticize eating disorders and self-harm, treating these behaviors irresponsibly.

It is relevant to understand that the diagnosis of mental disorders is a complex process that requires time, research, and the guidance of qualified health professionals. Self-knowledge is important, but self-diagnosis based on superficial information can be dangerous. Identifying with characteristics presented on social networks can be a starting point for seeking specialized help, but it should not be considered a final diagnosis.

Mental health professionals play a key role in raising awareness and providing accurate information about mental disorders. Overcoming the trivialization of psychopathologies requires a joint effort: constant updating of health professionals, responsibility of content creators and dissemination of solid and true information.

FINAL CONSIDERATIONS

Social networks have radically transformed the way we connect and interact, offering undeniable benefits in terms of communication and access to information. However, the negative impacts of these platforms on mental health cannot be ignored. This article highlighted the complexity of the effects of social networks, highlighting the need for a multifaceted approach to mitigate their risks.

It is imperative that we recognize the specific triggers present in social media that contribute to psychological problems, such as social comparison, the spread of misinformation, and digital addiction. Digital platforms, with their algorithms designed to maximize engagement, often encourage behaviors that can lead to mental disorders. Connectivity should be a bridge to understanding, not a chasm to mental health.

Educating users about media and digital literacy is an essential strategy. Teaching skills to identify and avoid misinformation, manage social comparison, and practice robust "digital hygiene" can significantly reduce the negative impacts of social media. Setting clear boundaries for social media use and promoting offline activities are key to maintaining psychological balance. True connection begins when we disconnect from screens and reconnect with ourselves.

Social media has the power to bring people together, share knowledge, and inspire positive change. However, it is a collective responsibility to ensure that these benefits are not overshadowed by mental health risks. Balance is the key: let's use social networks as tools for connection and growth, not as sources of stress and personal devaluation.

Ultimately, the success of our social media interactions will depend on our ability to integrate education, public policy, and psychological support into a concerted effort to promote healthier and more conscious use of these platforms. The digital revolution will only be complete when we balance technological innovation with human well-being.

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Conceptions of language in school: Ideological and paradigmatic clashes

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Sérgio Gomes de Miranda[1]

ABSTRACT

This text synthesizes a qualitative research, produced from the Research Project: "The Conception of Language in School: ideological and paradigmatic clashes" and the "Study Group: Language and Ideologies: to think about Interdisciplinarity and Literacies - GELI", developed from 2019 to 2021, within the scope of the State University of Goiás – UEG, whose objective was to investigate the conceptions of language of students of this university and teachers who work in the basic education network of Iporá and surrounding municipalities, participants in the study, with a focus on changing paradigms in language studies. Eighteen students and twelve professors participated in the study. Based on observations of classes and questionnaires answered, the study data were produced, which were transcribed and analyzed, and are presented here, in the form of a synthesis, as research results. This text responds to the five specific objectives of the study and its general objective. In summary, the participants are divided regarding the idea of language as a school object: some still linked to the notion of language teaching as teaching grammar or grammatical nomenclature; others attuned to a perspective of language in its inherent complexity, as an interface of the social life of its users. The research demonstrates that the conceptions of language expressed by the participants reveal respect for the subjectivities and identities of the students of the basic school, understanding them in their interactions and real ways of life. The language practices of the participants act in the space of contradiction, in relation to the impositions of the system.

Keywords: Research, Paradigm Shift, Teaching-learning, Language.

[1] Professor., State University of Goiás – UEG
E-mail: sergio.miranda@ueg.br

INTRODUCTION

This text summarizes a research approved and developed within the State University of Goiás – UEG/Iporá, whose main objective was to investigate the teaching-learning of language in the university and in the basic school, regulating the focus for the change of paradigms in language studies, in order to understand its basic ideological assumptions.

As Vasconcellos (2005) teaches us, the paradigm shift that is underway in the sciences places in a position of confrontation three epistemological axes that govern modernity: "simplicity"; "stability"; "objectivity"; and, in opposition, three axes on which postmodern science is based: "complexity"; of "instability"; and "intersubjectivity". Within linguistic studies, as a reflection of these clashes in the sciences in general, Agha (2007) lists three aspects that characterize this modern epistemic project. In summary, the extractionist aspect, characterized by the extraction of a small fraction, called language, from the interior of the totality of language and by an invention of this language that will be chosen for study; the restrictivist aspect, characterized by the creation of exclusive limits for a discipline, instituting a field of knowledge for the study of the extracted object; and the exclusionist aspect, marked by the prior exclusion of those who can or cannot be called linguists. In these three basic aspects for the study of language, the object, the field of action and the researcher for this field and for this object are reified. In contrast, Agha (2007) also presents the three postmodern aspects. Briefly, the expansionist aspect, which understands language as a historical, cultural and discursive formation. Language is recognized in its inherent complexity; the integrationist aspect, characterized by the perception of language in its contextual insertion, manifests itself in different genres of text expressed in the realization of this language: instead of structures, the set of discursive practices; and the collaborative aspect, in which linguistics is integrated and, at the same time, part of a field of action composed of different disciplines, but which dialogue for a common cause: an enterprise that links the study of linguistics to other forms of social scientific studies.

Here, in this text, it is understood that, as Moita Lopes (2013) argues, linguistic research needs to employ a reasoning that is focused on what is local, without forgetting its relations with what is global, at the same time. Moita Lopes (2013) argues that new theorizations and new perceptions of linguistic ideologies are important to deal with the various natures that construct language: "[t]he linguistic ideologies are multiple and come from specific political, cultural, and economic perspectives" (MOITA LOPES, 2013, p. 21). Changing paradigms means transforming ourselves and, consequently, the knowledge we produce. Feyerabend (2011, p. 33. Emphasis added) explains that "science does not know 'naked facts' at all, but that all the 'facts' we become aware of are already seen in a certain way and are therefore essentially ideational." In summary, all scientific practice is inherently ideological.

The research produced and that gives rise to this text was driven by the following Research Problem: "What are the conceptions of Portuguese language/language that are put into discourse and practices by the students of the Letters Course – Iporá and by the teachers of the Basic Education Network of Iporá and neighboring municipalities, participants in this research, in the sense of thinking about the ideological clash modernity versus postmodernity that is established by the paradigmatic change underway in linguistic studies?"

The objectives of the text were: general – "To study the conceptions of Portuguese language/language that are put into discourse and practices by the students of the Language Course – Iporá and by the teachers of the Basic Education Network of Iporá and neighboring municipalities, participants in this research, in order to think about the ideological clash modernity versus post-modernity that is established by the paradigmatic change underway in linguistic studies."; specific – "To analyze the language practices and activities put forward as means for the teaching of the Portuguese language at the secondary level"; "To analyze the paradigmatic adherence of the school to the teaching of the Portuguese language through the literacy practices placed in the teaching and learning process"; "To analyze if and how interdisciplinary relationships are placed, with a focus on language teaching"; "To investigate what are the Conceptions of Language, Literacy and Interdisciplinarity brought by the students of the Letters Course-Iporá, participants in this Research".

METHODOLOGY

The Research Project had as participants, twelve (12) teachers of Portuguese language who work in public schools of basic education located in Iporá and surrounding municipalities, as well as eighteen (18) students in teacher training of the Letters Course of the State University of Goiás - UEG/Iporá, who, after being invited, volunteered to participate in the study. Under my supervision and coordination, the "Study Group: Language and Ideologies: to think about Interdisciplinarity and Literacies" was formed; henceforth, only "GELI", in which the students met with me to study about the change of paradigms in language studies, to deepen their knowledge about how to produce qualitative research, as well as to improve their knowledge about the production of instruments for the production of data in scientific studies. With the advent of the COVID 19 Pandemic and its worsening, the study underwent reformulations, to allow interaction and continuity of the study, in the same way as the classes of the course subjects. In this sense, everything that was face-to-face started to take place remotely, mediated by the internet.

The study was characterized as a qualitative research, of an ethnographic nature, since it intended to study the concepts of Language that the participants had and disseminated through their practices and in their context of occurrence, focusing on its qualitative dimension. As Lucena (2015) explains, a study is called ethnographic research mainly because of its time limits, in comparison

with the long time that studies called ethnographic research demand. Thus, the central aspects of ethnography are preserved in both types, in particular, the democratization of the forms of knowledge production: "bringing to light situated realities and practices of language that are little valued in relation to hegemonic discourses." (LUCENA, 2015, p. 79).

Based on the research schedule, first the "GELI" was formed; then, invitations were extended to the teachers of the basic school, as well as the submission of the instruments produced in the study. The duration of the project was 24 months, from the second half of 2019 to the end of 2020. Because of the COVID 19 Pandemic, changes in the university and basic school calendars were necessary, messing with all the previous programming and, therefore, changing the lives of all those involved in the research. Also due to the pandemic and all its impacts, another objective was added to the research: "To analyze how teachers self-evaluate and how they evaluate their general performance, regarding teaching and learning, during the period of remote teaching, due to the COVID 19 Pandemic." In all, there were eleven actions that were completed and that structured the production schedule of the research.

The instruments for the production of the research data were produced jointly, by me, as the study coordinator, and by the student-participants, based on the theoretical framework of the study. Initially, the Questionnaire would be used; Direct Observation; and the Semi-Structured Interview. However, because of the many changes in the university's academic calendar and school calendars due to the COVID 19 Pandemic, the study also had to undergo changes in terms of temporality and methodology.

Amid the complexity of sudden changes, some alterations were necessary; such as: the entrance to the school, for the presentation of the project to the teachers, was changed to the individualized invitation to the teachers; instead of the Observations of the classroom classes, the classes were observed and the activities were analyzed through remote interaction platforms, guided by a thematic script, which directed the look to the practices; the Consent Form and the Questionnaire, which would previously be delivered in print, were sent by email or WhatsApp to the participating teachers by the participating students and sent back, through the same digital means. Mainly due to the increasingly strict recommendations for social isolation, Interviews were avoided. To reduce the damage to the study due to the lack of this instrument, its main questions were incorporated into the Questionnaire, which began to ask about the teaching profile and about theoretical and practical elements that would help to better understand the teaching work in basic school and to respond to the problem of this study.

The descriptions and preliminary analyses of the data produced were the responsibility of the student-participants: to receive the resubmissions of the questionnaires answered by the participating teachers, to preliminarily organize the data from the observations of the classes attended. Three (03)

classes of each of the twelve (12) participating teachers were observed, in different grades/classes of basic education. In all, thirty-six (36) classes taught were observed by the student-participants. It was up to the project coordinator to improve and deepen the descriptions and produce the analyses. After this phase, the selection of the pertinent data for the production of this text was carried out.

THEORETICAL FRAMEWORK

This research was inserted in a broader ideological discussion, which has as its core the change of the modern epistemic model of language studies, characterized by the stabilization of language to the code and the idealization of its uses and its users, by a more complex model, centered on the paradigm of post-modernity, which seeks to understand the ideological aspects present in language practices in their real uses, in situated contexts.

It is defended, here, that there is a network of ideological power that directly affects the role that education should play and, for this very reason, resonates in the processes of initial and continuing training of the teacher, in his or her performance and in the results of this action for the training of his or her apprentices. The analysis of the inner functioning of this framework will find an amalgam between ideological currents that come together to exercise their power and dictate events and their respective consequences. Such ideological currents are known as: the paradigm of modernity; the ideologies of colonialism/nationalism; the ideology of globalization, governed under the power of capitalism.

The Paradigm of Modernity has, among several characteristics, the concern with creating laws, establishing rules common to all, producing generalizations, totalizing the context, perceiving a regularity of discourse. Moita Lopes (2006) clarifies that Modernity tends to be very well demarcated by currents and by scholars who intend to defend exclusive positions, disciplinary knowledge. Within this modern ideology, there are the marks of Western violence imposed in colonization processes. Santos (2004) points out that Colonialism was conceived as a civilizing mission in Western history, at a time when Europe dictated the development of the rest of the world. This ideology imposes a new geopolitical organization of knowledge, based on the imposition of ideas from the North and the creation of a periphery formed by ideas from the South, and has at its foundation prejudice, discrimination, cultural imposition, the dictatorship of knowledge. Pinto (2013) argues that Colonialism hierarchizes the users of the language into cultured and uneducated, as well as its uses. As for the ideology of Nationalism, originating from the French Enlightenment and German Romanticism of the eighteenth century, it associates language with a delimited and specific geographical space, forging a local identity, simulating a connection between territory, cultural tradition and language, establishing a uniform identity for the nation. Jacquemet (2005) exposes the criticism that most contemporary linguistic studies are still under the influence of the myth of Babel,

expressed in the ideological desire to maintain linguistic borders, allocate people to their respective territories, with the idea of connecting language with the emergence of the feeling of national identity. Another ideological current that enters this network is what is conventionally called Globalization. This ideology is used, above all, by the use of mass media, giving the impression that the world now appears as a huge society that homogenizes itself at all times. However, despite the peaceful impression that the hegemonic discourse tries to fictionalize, there is a macabre power relationship that crushes disadvantaged peoples. To explain globalization, Signorini (2013) points out that its ideological forces are borrowed from liberalism and neoliberalism: a wide range of globalizing processes, manifested under the aegis of the articulation between ideas, beliefs and values. The same author adds that, when it comes specifically to linguistic globalization, the best example is the "commoditization/commodification of English as a good access to the globalized world" (SIGNORINI, 2013, p. 77). In this ideal, every language represents a value in the global market. Moita Lopes (2006) argues that, today, we live in a new world order and a new capitalism. For him, globalization promotes elites and oppresses local lives: the former, "start to live transglobally"; the latter survive "without alternatives or the garbage of those who live transglobally" (MOITA LOPES, 2006, p. 24). It is not difficult to notice that the relationship between these ideological currents forms a network whose knots are tied by the capitalist system. There is a whole machinery that ranges from mega international agencies, from countries that lead global economic markets, through public policies for education and its management in the federal, state and municipal spheres, to local work that takes place in the classroom, in its realization.

The great challenges to be overcome for the change of language education in Brazil are completely based on changing this scenario. Moita Lopes (2013) argues that it is necessary to reflect on the ideology with which we operate: "there is a need to think about other theoretical constructs and analytical tools to account for what we understand by Portuguese and how to conduct linguistic research" (MOITA LOPES, 2013, p. 29). The aforementioned author defends and aligns himself with the creation of an anti-hegemonic agenda for the practice of research and language teaching. This implies the choice of certain theories, specific worldviews, "in order to open spaces for the creation of other alternative, fairer and more ethical social futures" (MOITA LOPES, 2006, p. 52). This change is understood as fundamental, since many dimensions of social life have been forgotten in the modern perspectives of doing research and education. In this regard, Love (2009) criticizes the neutrality of Western linguistics in the face of context, in order to establish itself as a science. In the same sense, Irvine (1996) highlights dissatisfaction with the classical model of linguistics; above all, due to the sentencing isolation for analysis, the invention of an anonymous speaker and listener. To affirm his position, Irvine (1996) stresses that it is essential to consider the context, as one seeks to analyze what includes the discourse, ideologically constituted.

A very important factor to imprint this change is the understanding that any transformation will not be carried out on a global scale, but, on the contrary, it will be exercised in local contexts, in actions situated and characterized by local forms of existence. All challenges to education bring with them their marks of locality. Fabrício (2006) explains that language should be seen in a way that is "inseparable from the social and discursive practices that build, sustain or modify the productive, cognitive and desiring capacities of social actors." (FABRÍCIO, 2006, p. 48).

To develop an enterprise of this magnitude and face the challenges that contemporaneity presents, it will be crucial to find ways to cope and engage. With this in mind, Moita Lopes (2006) understands that issues of ethics and power are implicit in this change, in the sense of thinking about language in an existence that "only comes to life when people and their subjectivities and histories are considered in the multiple and situated social practices of meaning construction" (MOITA LOPES, 2013, p. 104). The aforementioned researcher invites us to "go to meet the world in which we live in the twenty-first century [...] a crucial demand if we want our knowledge to be relevant to the social practices in which we are situated." (MOITA LOPES, 2013, p. 52)

NEW LITERACIES

Despite the local changes that are already taking place, even today, the model of initial and continuing training of teachers in many of our universities mirrors the modern paradigm. The concept that expresses this formative model well is that of autonomous literacy. In it, the language is restricted to the teaching of the standard normative nomenclature; literature is reduced to the fragmentation of literary periods; linguistics is limited to the delimitation of theoretical currents. As Street (2012) teaches, the concept of autonomous literacy explains well an education that is characterized by uniqueness and association with a unique culture. Kleiman (2012), in turn, emphasizes that this is the model that has still been maintained in our society since the last century. From this perspective, language and literature are conceived as entities neutral to social reality. In this vein, Jordão (2013) highlights the consequences of this view: an abstraction of the communicative process, stabilized in the code; the reproduction of this code as an object of teaching, as a substitution of language; The classroom is limited to having as practices the "memorization and reproduction of the "relatively stable" forms socially available for the linguistic construction of texts." (JORDÃO, 2013, p. 355. Emphasis added)

In turn, Rocha (2012) denounces that "[i]f the school often legitimizes a single practice for literacy, it also legitimizes certain sociabilities linked to it" (ROCHA, 2012, p. 01). Kleiman (2008) explains that one of the reasons for this is the reductionism embedded in the guidelines about knowledge regarding teacher training. A deeper reading of what is put here by these scholars reveals that the central problem of this autonomous model adopted for teacher training seems to be

associated with the fact that the current world is multiple, complex, marked by different flows, especially if we think about the discourse and the media environment; And yet, our classrooms, university and basic education, remain obsolete, without being contaminated by these current transformations in the world.

For a transformative spirit, teacher training must always be in the process of self-contestation in the face of the challenges of the teaching role. Therefore, teachers must understand the premise of always being interdisciplinary scholars, attuned to the world, beyond traditional training and the predetermined curriculum. In this attempt to discuss the more comprehensive training of teachers, Street (2012) highlights the concept of "literacy practices", in the way of associating literacy with cultural and social spheres, as well as with a broader conception of the cultural contexts in which people apprehend the meanings and senses of the world to which they are integrated. Based on this notion, this scholar proposes a change from the autonomous literacy model to the ideological literacies model. At the center of this conception, "literacy is considered a field to investigate the processes of hegemony, power relations, practices and competing discourses, instead of exploring the great division and relative rationality of modern and traditional societies." (STREET, 2012, p. 83)

By adopting the concept of ideological literacies, by extension, a new way of looking at the role of education and teacher training is configured. As Rocha (2012) teaches, literacies "are ways of acting in the world that consider the social contexts in which the action takes place" (ROCHA, 2012, p. 04).

Also concerned with this aspect of teacher training, Monte Mór (2013) warns of the importance of including the topic of language teaching policies in the curriculum of initial and continuing teacher training, as well as during their work as teachers. From this perspective, the teacher's performance makes more sense, as it reflects the most proximal traits of his or her life and the lives of his or her learners. This position is in line with the opinion expressed by Pessoa (2014), when he states that we can no longer see education as a neutral or autonomous activity. For the author, we have to believe in alternatives for the world we live in, increasingly governed by the interests of capitalism.

Academic production only makes sense if it positively influences the practical life of people and their ways of knowing, especially those people who live on the margins of social life based on the power of capital. Interested in new ways of producing knowledge, Arnold et al (2012) advocate a continuum between school and university, with the aim of refining teacher training and building professional development. The aforementioned authors thus bring the concept of "critical praxis" to educators, in the sense of going beyond the formal constraints of curriculum and knowledge, to encourage the local community, students and teachers to act together in the understanding of practices of general interest.

In order for what is stated above to be possible, a course correction will be necessary. This correction involves the inversion of the poles, with the public school as the starting point and the point of arrival, while the university will act as the mediator to meet the demands posed. To this end, it requires a new training profile and academic curricular dimension. In people's real lives, knowledge is not departmentalized. Language mediates all human relationships and gives them meanings and senses. A critical literacy of teachers is a primordial condition for the conquest of new directions for the linguistic education that occurs in school. This discussion posted above in this text is an attempt to reflect on some of the guidelines that lead to this transformation.

RESULTS

This section will be dedicated to the difficult task of synthesizing the production of the data and analysis of the research. For this reason, the objectives set to the study will be privileged, in order to try to demonstrate how they were tried to be achieved during the research process. This time, at the end of the project, several results can be highlighted that deserve to be highlighted for the development of the research. Below are these attempts to summarize the objectives achieved:

The first specific objective of the study was *"To analyze the language practices and activities put forward as means for the teaching of the Portuguese language at the high school level*." School practices are also language practices, literacy practices are at the same time language practices that teachers produce to mediate the expression or creation of the meaning of some knowledge, whatever their field of knowledge. The qualifiers of the analyzed teaching work are good: the interdisciplinary interaction, the teacher-student relationship, the selected contents, the literacies put into practice, among others. The analysis of this research theme leads us to the understanding that language/language as an object to be taught in school is in a process of construction of its meaning. Among the participants, four (04), when conceiving the language as an object of teaching at school, associated it with the teaching of grammar and/or the cultured norm, with a focus on the written record. An idea of regulation of student discourses is perceived, when they identify in their productions that they distance themselves from the set of norms of prescriptive-normative grammar and in the demands of students for this knowledge when producing their activities. For them, teaching the language is teaching grammar or teaching textual genres in their relatively stable forms. This dichotomy in language teaching practices appears in Cerutti-Rizzatti (2013), when he warns that, due to the strength that the hegemonic paradigm still holds in our schools, we are only replacing one type of categorical study with another, since textual genres end up being transformed into objects in themselves, instead of social practices of language use.

From different perspectives, the other participants see language as an object for teaching at school from the perspective of communication and reading beyond decoding; in defense of the

"reading of the world", of the identification of language with the identity and history of people and communication; linguistic variations and diversity; the importance of literacy and literacy. Analyzed from the pedagogical point of view, these positions point to a very important way of understanding language as the content of classes, since language multiplies and changes as many times as the contexts and situations of reading, of productions of activities are modified. Also, there is the understanding of a meaningful school for its learners, which can open to them the world of meanings that is around them, in a critical way before this world, so that they can also walk their own steps, with the due autonomy for this. In the way it is analyzed here, this position of the participants is very important, as it thinks about language from the social and cultural perspective, as its defense has a political, critical and ethical nature for the role of the school and the teacher, in the face of the theme of linguistic prejudice, of the social differences that extend from society to the school and from there to society. Here we see a place more open to the plurality of discourses, especially for the discourses of students, which have been neglected for so long. Moita Lopes (2006b) embraces this view by arguing that contemporary applied linguistics should have the understanding of reality as part of an ethical research project, in the sense that the construction of knowledge is associated with change in social life. In the author's own words, it is "fundamental to problematize social life, in order to understand the social practices in which language plays a crucial role" (MOITA LOPES, 2006b, p. 102).

The second objective was: "*To analyze the paradigmatic adherence of teachers to the teaching of the Portuguese language through the literacy practices placed in the teaching and learning process*." There was opposition among the research participants: of the twelve participating teachers, half claim to work with a focus on the concept of literacies and/or their practices. The other half say they have not studied literacy practices. It is evident that there is an inviolable relationship between the conceptions of language and the practices of literacies. The more language is stabilized, as a grammatical structure, affecting its original role and potentialities, the more the notion of literacy and its practices will be limited.

It was possible to analyze that, because they did not study literacy in their initial and continuing education, some understand literacies as a kind of course that is taken with people who did not have the opportunity to attend school and who are learning to read and write in adulthood. Likewise, they refer to learners who have difficulties with reading texts and with formal written production. It is clear that continuing education for teachers is very much needed. For the analyses made regarding the participants, the literacies are still in their process of constructing their meanings as practices that the school must produce daily within it. In their own performances, it was also possible to analyze the literacy practices that are identified here as ideological literacy practices: excellent texts and teaching mediations for the critical reflection of social issues by students.

Another relevant aspect was the regularity regarding the use of didactic material for their classes: when the students had some type of didactic material to support the study in the classroom, for the activities to be produced and for the monitoring of the presentation made by the teacher, better participation and interest in producing was perceived. Whether it is a photocopy taken by the teacher to class, or the textbook of the course, or a printout made from a web page, etc., the didactic material for the use of the students was a fundamental element for the quality of the classes: the use of class time; the ease/quality of teacher-student interaction; the deepening of the discussion and the possibility of a more effective literacy work. In general, this genuine contact with the written text, whether it is in any medium, constituted a very significant element for the students, especially for the purpose of learning to read and write. As Rampton (2006b) understands and defends, the analysis of language must be done with an eye to situated experiences, so as not to make the mistake of reifying language as a contextually sterile and stable object in terms of the interlocutors and their performances in these contexts.

The use of other resources and other technologies by teachers during the observations is highlighted, such as a sound system; Datashow etc.; With this, the teacher maintains a more direct and interactive interaction with the students, since the class is less dispersed, with greater conditions of concentration on the theme of the class. In analysis, these various factors linked to the use of these materials revealed a fundamental aspect of the participants' teaching literacies, as well as their condition to offer learners more significant literacy practices for their learning. Moita Lopes (2013b) argues that in school the practices should be genuinely real practices for the students' lives, so that they can identify with them and so that they can perceive and produce the meanings of the interactions they produce within these practices; that is, so that they are not limited to only practices that serve the school. In this sense, the participants aimed to lead students to think and act critically in the face of the topics studied. Regarding this teaching attitude, Hall and Walsh (2002) point out that our linguistic, social and cognitive knowledge is closely linked to our participation and active learning in events and activities that are socioculturally significant. The principles of the post-modernity paradigm are the critical position and the engaged posture of the teacher in the face of their global/local realities and those of their learners. By adopting this attitude, the participants made their classrooms a place for reflection, discussion and confrontation with the challenges that are presented to us. This work done by the participants and analyzed here is in line with what Cerutti-Rizzatti (2013, p. 250) proposes as a school action that has as its identifying mark the commitment, "the will to give the pedagogical process a direction that reveals less artificiality and favors meaningful learning".

The third objective sought in the research: "*To analyze if and how interdisciplinary relations are placed in the school, with a focus on language teaching."* All participants answered that they

know interdisciplinarity, as well as that they recognize its importance and benefits for teaching and learning. In the same sense, all of them stated that they had studied about this concept, both in their undergraduate and specialization programs. This is a crucial aspect for teacher training and its practices, since the defense of interdisciplinarity is inserted in the process of paradigmatic change underway in the university and in basic schools. However, all of them also answered that they had more theoretical knowledge than practical experiences with interdisciplinarity. This analysis is in line with Severino's (2001) critique that interdisciplinarity needs to be resized theoretically and, in its practice, it needs to be constructed. This revelation of the participants makes perfect sense, given the fact that in many higher education courses, in various areas, more specifically in the teaching degree courses, the interdisciplinary matrices, based on genuinely interdisciplinary projects, have not yet been implemented. At the State University of Goiás – UEG itself, as will be seen later in these analyses, the Curricular Matrices of the Letters Course of the State University of Goiás – UEG, from 2009 and 2015, which will be highlighted in this text, completely ignore this important concept.

The participants denounce that the teaching days in several shifts, the legal structures of workloads, the relationships of the semester disciplines in the organization of the matrices, etc., leave little room for continuing education, as well as great physical and mental exhaustion for this cause. Another factor is the defense that teachers make of their performances, in the sense of protecting themselves in their specific knowledge. Each knowledge has its space occupied and represented in those who are its specialists, while disallowing others to deal with knowledge from areas other than their own. Domingues (2012, p. 01) criticizes that our teaching is still "ultra-disciplinary, the departments function as true registry offices." This makes cooperation very difficult, with little or no possibility for experiences that go beyond the "walls" of disciplinarity. The participants in this study extend their criticism from their own personal formation, regarding the concept and interdisciplinary practices, to broader views of the entire education system to which interdisciplinarity seeks to become an integrator, but which, due to various conditions, it is not yet effective. The greatest adversary of interdisciplinarity, in this view, is the modern paradigm that persists in our educational system, from its political management, through the structuring of the curriculum, affecting classroom practices, both in training courses and in their results in the basic schools where graduated teachers go.

The fourth specific objective of the research consisted of: *investigating what are the Conceptions of Language, Literacy and Interdisciplinarity brought by the students of the Letters Course-Iporá, participants in this Research.* When analyzing the Matrices of the Letters Course of the State University of Goiás – UEG, from 2009 and 2015, it is easy to see that the Matrices and Syllabuses are built in a form of sequence and gradation of concepts and contents, within the disciplines. In this way, the disciplines gain a gradation and a deepening in terms of knowledge

related to language, language, linguistics, literature, etc. However, in this organization of these same concepts and contents, the connections between the disciplines are strongly impaired, since, by separating the linguistic currents, the literary currents, the Portuguese language disciplines, the English language disciplines, etc., within watertight semesters, barriers are created between them, in each year or semester of the course. Thus, students do not come to establish the existing relationships between these disciplines, their syllabus, their concepts and contents; that is: there is no *Interdisciplinarity.* In this study, it is important to emphasize that, when analyzing the *2009 Curricular Matrix of the Letters Course*, in its Syllabuses and Bibliographies, only once is the concept of *Interdisciplinarity mentioned;* namely: in the *3rd Year of the Course*, in the discipline *"Guidelines for the Supervised Internship of Portuguese Language and Literatures I".* In the same direction, in *the 2015 Curricular Matrix*, *Interdisciplinarity* appears as one of the themes to be addressed in a knowledge framework of an *"Optional" discipline* of *"Free Core"*: *"Interdisciplinary Projects in the Classroom."* This finding makes it clear that there was no concern in the construction of the *2009 Curricular Matrix*, nor in the *Construction of the 2015 Curricular Matrix*, in addressing the Concept or putting *Interdisciplinarity into practice.*Such a concept and its practice would only appear in the students' education, in a more consistent way, through the individual initiative of some teacher in approaching it and/or putting it in their practice through projects with other disciplines. In other words, there is no institutional interdisciplinary project that integrates the disciplines and their knowledge and/or contents within the curricular matrices of the course analyzed.

In the same analytical direction, regarding Literacies, the aforementioned Curricular Matrices of 2009 and 2015 present the same characteristics highlighted in relation to Interdisciplinarity. In *the 2009 Curricular Matrix*, the word Literacy appears only once, in the subtitle of a book, which appears in the references of the discipline "*Guidelines for the Supervised Internship of Portuguese Language and Literatures II",* offered *in the 4th Year of the Course.* However, it is not one of the themes of the Syllabus of the aforementioned discipline. In *the 2015 Curriculum Matrix,* the word does not even appear. Again, there is no concern about the concepts and/or practice of Literacies in the construction of the matrices of the Letters Course. That is; there is no institutional project for the discussion of the concept and practices of Literacies. This is worrisome, since teachers are being trained who will have to work daily with literacy practices for the training of their students in basic school. It is worth mentioning that, in an attempt to minimize this formative loss, at the initiative of the teachers of the Letters Course – Iporá, in 2016, a Specialization in Literacies was offered, which has just received its authorization for a re-edition. This is an important training opportunity for the institution's students and teachers from the basic education network of Iporá and surrounding municipalities. This is one of the themes introduced in academic research since the second half of the

twentieth century, and it has been more strongly defended since the beginning of the twenty-first century. It is clear that it is necessary to overcome the encapsulation of scientific knowledge.

With regard to the conception of *Language,* it is constructed in the gradation of the disciplines of Portuguese Language and Linguistics, year after year, semester after semester, within the Curricular Matrices, without the existence of one or more disciplines that synthesize it, for a more precise notion, as to the basic assumptions for its study, from the point of view of the paradigm or the paradigmatic clash between modernity and post-modernity. The Modern model of conceiving *Language*; that is: disciplined, atomized, esoteric, as an object of specific currents, represented by its specialists, is the hegemonic one in the Curricular Matrices of the Course. The focus on *Language* built on the assumptions of Postmodernity is present in only three disciplines: "Discourse Studies", but with a very fixed emphasis on the Theories of Discourse Analysis and its concepts; "Fundamentals of Sociolinguistics and Ethnolinguistics", but concerned with explaining the two currents, their differences and similarities; and "Applied Linguistics", with an emphasis on research and criticism of the various research methodologies in language studies.

During the course of the study, due to the changes brought about by the COVID 19 Pandemic, it was necessary to add another fifth objective; that is: "*To analyze how the teacher self-evaluates and how he or she evaluates the general performance, regarding teaching and learning, during the period of remote teaching, due to the COVID 19 Pandemic."* Among the twelve (12) teaching participants of the research, with regard to this objective, five (05) stated that they had no previous knowledge about Remote Teaching, Distance Learning, teaching mediated by remote technology, as in the current situation we are experiencing. Three (03) out of these twelve (12) stated that they had little prior knowledge for this remote work. Four (04) stated that they already had prior knowledge in this regard. Of the twelve (12) teaching participants, five (05) emphasized that they had not received any technical/technological support or little support. Another seven (07) highlighted having received support: either at the institution where they work, or through the Department of Education/Superintendence, or through online/internet courses.

When they analyzed their own actions during this period, the responses included positions of frustration, challenge, exhaustion, tiredness, demotivation, difficulties, uncertainties, dissatisfaction, learning, motivation, and innovation. All of them criticized the work overload, within school hours and after: the preparation time, the difficulties with choosing/preparing materials, availability of technological/technical resources for so much load of data, content, information, etc. With regard to their students, they evaluated learning with great concern; they claimed low student performance; a lot of resistance, low adherence and even aversion to the teaching modality and methodologies; difficulty in dialogue, in the interaction between teacher and student; a lot of student shyness in interactions; little student autonomy.

On the other hand, four (04) highlighted the engagement of some students; protagonism and autonomy; the support of the school community to the students. All twelve (12) teaching participants showed concern about social inequalities, social vulnerability and the difficulties that these inequalities and social vulnerability reveal, especially at this time of remote teaching. In this sense, even recognizing the opportunity for innovation, for learning new teaching methodologies, everyone was clear in showing that remote teaching has not been effective, with regard to teaching methodologies, teacher-student interaction, teacher mediation, promotion of student autonomy, pedagogical monitoring of learning and, therefore, understand that learning has been shown to be low, mainly because technical and technological difficulties, lack of access to the internet, social and economic factors are associated with pedagogical and psychological aspects to impair the teaching work and, consequently, student learning.

Finally, we arrive at the Problem and the General Objective of the study, amalgamated in the following question: *What are the conceptions of Portuguese language/language that are put into discourse and practices by the students of the Letters Course – Iporá and by the teachers of the Basic Education Network of Iporá and neighboring municipalities, participants in this research, in order to think about the ideological clash modernity versus post-modernity that is established by the paradigmatic change underway in the linguistic studies.*

One of the factors of great interference in the teachers' attempts to contribute to the learning of their learners, during the observations, was the silence of the students, in an almost absolute way, during most of the classes. In many of the cases analyzed, the predominance of student silence during classes was due to the concern of some participating teachers for being observed in their classroom practices. Thus, they ended up creating a change in the interaction with the students, as well as in the student-student relationship. This practice is related to the idea of controlling the behavior of the class. This caution created a kind of regularity regarding the disciplined behavior of students during classes. This teacher-student and student-student interaction is opposed to the already widespread view that the public school classroom is an unfavorable environment for teaching work, due to the undisciplined behavior of students. As a way of trying to hear the voice of their interlocutor, some teachers instigated the students to give their opinions, to talk about the theme, to bring examples, achieving relative success in this proposal. During the research there was no aggression or disrespect to the professors, not even among students. From another perspective, the criticism that orality is not well worked in school is already widespread. Thus, the teacher's protagonism remains as a methodological option in the classes and the students' role of listening to the teacher. Bakhtin has interaction as one of his main theses for the understanding of language. As he teaches us, in the social relationship "every ideological sign, and therefore also the linguistic sign, is marked by the *social horizon* of a given time and social group" (BAKHTIN, 2010, p. 45. Emphasis

added). When dealing with language as an object of study, he emphasizes that "[t]he true object is the interrelation and interaction of the 'spirits'" (BAKHTIN, 2003, p. 373. Emphasis added). In other words, giving freedom to students means, in this sense, horizontalizing the relationships in the classroom, privileging interaction, as well as recognizing the diversity inherent to any school class.

In the interactions between teachers and students, it was possible to find a regularity: the participants adopted, in most classes, as a discursive-pedagogical model for the exposition of the contents, the uses of formal/technical terminology, both in the practices of reading the texts and for writing during the examples; as well as, for the explanation/discussion of these contents, they made use of the paraphrase of this technical terminology of the text studied. The students did not show concern with the formalisms of the language. They were free to express themselves in their most everyday way, naturally, even with the observations of the classes. There was no teacher concern with the legitimacy or non-legitimacy of the students' linguistic uses. Seen from the analytical perspective adopted here, the posture of the participating teachers in the face of these forms of expression of the students in the observed interactions can be characterized as an anti-hegemonic form, since, from the modern perspective of interaction in the classroom, the privilege of the so-called cultured norm and the discredit of the other variations can be seen. Thus, the participating teachers are taking into account the diversity that marks all social interaction, respecting the history of the subjectivities of those who share the rich space of the classroom with them. In this way, the participating teachers are awake to what Pinto (2013, p. 143) defends: "it is time to give up the fallacy of identity prefiguration rooted in the supports of writing and grammar".

The mediation for the learning made by the participating teachers adopted the practice of reading aloud, carried out by the teachers and, in a few opportunities, carried out by the students. This initiative seems to me to be a good opportunity for literacy, given the fact that reading was not limited to the purpose of answering a questionnaire, or a school task. Reading aloud is an important form of interaction in the classroom. This initiative under analysis here proved to be a significant aspect of classroom relationships. It was clear how important the teaching mediations are and how revealing it can be in this process of knowing.

In summary, it was seen that the participants are aware of the importance of their roles for the meaningful learning of their learners. The participants are divided regarding the idea of language as a school object: some still linked to the notion of language teaching as teaching grammar or grammatical nomenclature; others attuned to a perspective of language in its inherent complexity, which integrates active reading before the text, writing endowed with meaning and language as an interface of the social life of its users. In this sense, the participants expressed a lot of potential for the production of their work, indicating that, despite the many constraints imposed by the system on

their roles, their discourses and practices demonstrated that they are aware of their context and their teaching condition, in the face of the challenges that arise in the school.

FINAL CONSIDERATIONS

The practice of research almost always brings unexpected elements, compared to what is initially projected before the study. Proof of this are all these changes in the schedule and methodologies expressed above that the study went through. For this reason, it is worth saying, a path of predetermined certainties was not proposed for the study, but a journey of attempts, constant self-reflection and self-criticism. In this ethical sense, an inquisition was not established for the discourses and practices of the participants, nor was it intended to construct a prescription for the conduct of the participants, as regimes of truth.

Contemporaneity is marked by great social and scientific transformations. A new society is rapidly emerging, as well as new ways of living and understanding the world. The school is a prominent place as a *locus* of social disalienation. However, the participants denounced a huge framework of impositions of the system on the school and on its teaching performances.

In this research, the conceptions of language expressed by the participants reveal the recognition of the community by which the school is involved. Respect for the subjectivities and identities of the students was perceived, understanding them in their interactions and real ways of life. Here, this respect and understanding are integral to the paradigm of postmodernity. The language practices of the participants act in the space of contradiction, in relation to the impositions of the system. They resignify their conception based on modernity and express the adoption of language in the real practices of people's lives.

Due to the characteristics of this research, its analyses and results cannot be generalized to the professors who work throughout Brazil. However, some of the aspects highlighted here are easily found in the network in education in our country, in particular, the arena of forces between the system that governs education and the teachers who work in public schools.

The road to be covered for the education we dream of is still quite long. However, the challenges must be faced. Many have already taken the first steps on this journey of transforming our study models and teaching practices. Whoever decides to walk this distance will never be alone: there will be interaction and support. The transformation will not be carried out on a global scale, but will be exercised in local contexts, in situated actions. All challenges to education bring with them their marks of locality, the main reason for the school to be thought of with a view to those who live the daily school life.

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Obtaining and quality of pre-dried ryegrass

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Gabriela Thaís Klahr[1], Kelli Flores Garcez[2], Cibele Regina Schneider[3], Lueli Fernandes Bragança[4], Igor Kieling Severo[5], Cleiton José Ramão[6], Rodrigo Holz Krolow[7], Luiza Vandrielli Goulart Unamuzaga[8], Mariana Siqueira Barrilari[9], Caio Seiti Takiya[10], Marcela Abbado Neres[11] and Deise Dalazen Castagnara[12]

ABSTRACT

The possibility of using annual cold season grasses for the production of pre-dried is justified by the nutritional value of these forages, such as ryegrass, and because they do not compete in relation to planting areas with grain crops. Obtaining pre-drying subjects the plants to cutting and wilting for subsequent silage. Aspects such as water content, nutritional value, buffering capacity and soluble carbohydrate contents of the forage to be ensiled as pre-dried interfere with the speed of dehydration, fermentation processes and quality of the pre-dried obtained. In addition to these, factors such as forage fertilization, care in storage and supply of preserved forage also affect the quality of the final product offered to the animals. However, it is possible to obtain pre-dried products of high nutritional value from ryegrass forage and the adoption of wilting techniques and forage conservation in anaerobiosis.

Keywords: Nutritional composition, Conserved forage, Lolium multiflorum, Ruminants.

[1] E-mail: gabriela.klahr3@gmail.com
[2] E-mail: kelligarcez15@gmail.com
[3] E-mail: cibeleregina17@hotmail.com
[4] E-mail: luelibraganca.aluno@unipampa.edu.br
[5] E-mail: agro.severo@gmail.com
[6] E-mail: cleiton-ramao@irga.rs.gov.br
[7] E-mail: rodrigokrolow@unipampa.edu.br
[8] E-mail: luizaunamuzaga.aluno@unipampa.edu.br
[9] E-mail: marianabarrilari.aluno@unipampa.edu.br
[10] E-mail: caiotakiya@utfpr.edu.br
[11] E-mail: marcela.neres@unioeste.br
[12] E-mail: deisecastagnara@unipampa.edu.br

INTRODUCTION

In animal production systems, feed represents most of the costs, and it is essential to search for alternatives applicable to the field that minimize expenses and promote efficient performance. In the supply of forage to ruminants throughout the year, there is the occurrence of productive seasonality, caused by the drop in temperature and luminosity. This scenario contrasts with the drop in animal productivity and one of the alternatives found by man to overcome production losses during this critical period is the conservation of forages (Fluck *et al*., 2018).

Among the storage practices commonly employed by cattle breeders, haymaking, silage and baling stand out. Such processes aim to preserve the quality of natural matter with minimal losses during drying and storage (Meinerz *et al*., 2015). However, compared to silage production, the haying method presents some obstacles that can compromise the final quality of the forage obtained. Among these, the longer time of exposure to the air and greater demand for equipment and labor stand out. In this context, and in order to reduce the risks and costs that the haymaking process presents, an interesting option for the conservation of forage is pre-drying. In this technique, the forage is pre-dried with subsequent baling and packaging, obtaining the anaerobic environment necessary for fermentation (Nath *et al*., 2018).

Pre-drying is an extremely necessary step for the preparation of forages for the production of pre-dried, because coinciding with the vegetative phase of greater nutritional value, the plants have a high percentage of moisture. In this way, the partial removal of water ensures a low incidence of secondary fermentations and a lower loss of nutrients by effluents during storage (McDonald; Henderson; Heron, 1991; Nath *et al*., 2018). However, changes occur in the chemical composition of plants during the drying, gathering and storage process (Jobim *et al.,* 2007).

Several forages can be used for the production of pre-dried, including summer and winter grasses and legumes. Ryegrass (*Lolium multiflorum*) has high potential for pre-dried production, due to its ability to adapt to different climatic conditions and speed of dehydration. In addition, it has a high proportion of leaves and thin stems and is recognized for its productive and nutritive properties (Pedroso *et al*., 2004; Pellegrini *et al*., 2010; Oliveira *et al.,* 2015). Several cultivars (cv) of ryegrass are known, and among them, there is great genetic variability, which is reflected in different yields, nutritional composition, ability to adapt to the planting environment and resistance to diseases (Balocchi; Lopez, 2009; Cassol *et al.,* 2011). Increased yield, chemical composition and digestibility of forages are also observed when fertilization is applied to the soil and tillering of plants (Carvalho *et al*., 2004).

In regions of the country where the cultivation of summer crops such as soybeans and corn is practiced, it is common among producers to take advantage of the residual effect of nitrogen fertilization. On these occasions, the practice of base fertilization is not carried out in the

implantation of grasses, only top dressing, which can negatively affect the growth and bromatological composition of the plants (Cassol *et al.,* 2011).

In this context, studies are needed to identify fertilization strategies for forages with potential for silage and to evaluate the losses resulting from the drying process of this material, aiming to increase the productivity and quality of the final product. Thus, the objective of this review is to highlight the potential of the use of pre-drying with forage conservation technique, as well as the factors that interfere in the quality of the pre-dried products obtained, especially the pre-dried ryegrass products.

LITERATURE REVIEW

PRESERVATION OF ROUGHAGE FEED FOR RUMINANTS

Ruminants have the ability to transform roughage feed that does not compete with human consumption into sources of energy, protein, minerals and other nutrients necessary to supply animal metabolism and meet production demands. Grasses are valuable sources of nutrients for ruminants, and the competitiveness of Brazilian livestock activity is largely related to animal production on pasture, considered the most economical livestock system (Barcellos *et al*., 2008; Skonieski *et al.,* 2011).

It is not only a recurring problem in Brazil that the drop in animal productivity during the forage season period is a recurring problem. As it is an inevitable period that is repeated every year, as it occurs due to climatic factors, producers must be prepared for these. Among other practices, the preservation of food through silage has generated excellent results, due to the ease of processing, storage and the final quality of the product, when well conducted (Dantas; Negrão, 2010).

When it comes to the preservation of food for the production of roughage in Brazil, we have at our disposal several plants and processes used for this purpose, such as sorghum, millet, corn, grass and hay silages of different forages. Regarding silage, the corn plant is the most used forage because it has high dry matter production per area, good nutritional quality, and adequate bromatological composition for storage (Ribeiro Junior *et al.,* 2011). However, the growth and development of corn are limited by water, temperature and luminosity, and its planting is feasible in the rainy season (Cruz *et al.,* 2010). Thus, the possibility of using annual cold season grasses for the production of pre-dried crops is justified by the fact that these forages do not compete in relation to planting areas with grain crops. Even in grazing systems, the surplus of forage can also be used, conserving biomass for times with limited food (Villalobos; Arce, 2016).

The storage of pre-dried grasses in Brazil has gained more followers in recent years, and the most used plants are elephant grass, brachiaria, oats, ryegrass and the genera *Cynodon* and *Panicum* (Evangelista *et al*., 2004; Dantas; Negrão, 2010; Oliveira *et al*., 2015). However, the low

concentrations of soluble sugars and dry matter in the vegetative stage of the plant, which is the ideal point for cutting, contribute to the high buffering power during the fermentation process of grasses (Muck, 1990). Due to these limitations, the ensiling process of green grasses presents undesirable characteristics, as they favor the occurrence of secondary fermentations, resulting in quantitative and qualitative losses (McDonald; Henserson; Heron, 1991). In these cases, the process of drying the plant, aiming to reduce humidity before the material is ensiled, is essential to obtain a quality roughage.

PRE-DRYING PROCESS

Aiming at the quality of grass silage, including pre-dried, pre-drying, or also called plant wilting, is an extremely necessary process in conservation, as it provides a reduction in the water available in the forage, improving the fermentative aspects Nath *et al.* (2018) and reducing effluent losses (Van Soest, 1994). In this technique, the removal of moisture from the plant consists of the partial removal of water from the forage, through exposure to the sun with or without movements, when it has high levels, that is, greater than 600 g/kg (60%).

Through pre-drying, the cutting of the plants can be carried out during the vegetative period, which ensures higher protein levels when compared to the haymaking process. In haymaking, the plants are cut at the beginning of the reproductive stage, to obtain higher DM levels in the harvested forage. Also, compared to pre-drying, haying causes greater protein losses due to the longer time of exposure to the sun, which leads to the development of the *Maillard reaction* (Van Soest, 1994).

In the vegetative period, when the cut for silage occurs, the forage plants have moisture content between 80 and 85%, and soon after the cut, the forage is spread in the field, where the moisture is quickly reduced to 65% through losses by the stomata, because the loss of water is intense in plants that are still alive. After death, the plant continues to lose water through the cuticle, and the collection of grasses is carried out when the plants reach humidity close to 45% (Moser, 1995). Reaching the required dry matter content, the forage is collected and ensiled and the product generated from this process is called pre-dried or *haylage*, which means in English an intermediate between hay and silage (*hay* = *hay and silage* = silage).

Plant dehydration is influenced by some environmental parameters, which are inherent to the plant itself and management, which optimize or impair the conservation of forage quality. During the loss of moisture from the plant to the field, right after cutting, solar radiation, temperature, air humidity and wind speed directly interfere with the drying rate, and the exposure to the field is adjusted for periods of 4 to 6 hours (Rotz, 1995). The cuticle is a waxy layer that covers the surface of plants and prevents the occurrence of physical damage, as well as reducing the loss of plant components by leaching and excess moisture. Stomata are also important in plant dehydration, being

the pathway through which approximately 85% of the total water inside the plant is lost, even after cutting (Rotz *et al*, 1994; Neres; Ames, 2015).

The plants show a decrease in the leaf/stem ratio, as well as a decrease in nutritional quality and water content according to the advance in vegetative development, changing the time required for dehydration of the plant according to age (Van Soest, 1994). For the pre-drying process, the low moisture content in the plant is favorable to accelerate dehydration, but it is detrimental in relation to the nutritional quality of the pre-dried. The management carried out in the field, such as turning and turning the raked material, if carried out in the first hours after cutting, helps in the rapid loss of moisture, as they provide greater air circulation (Bayão *et al*, 2016).

For the storage of pre-dried, different processes are used, and it can be preserved in the form of rolls or bales covered with a special plastic film or in silos with the use of tarpaulins for sealing, which have the common purpose of keeping the food in anaerobic ensuring the quality of the green forage.

PRE-DRIED IN BRAZIL

Brazil has an extensive territorial area, with more than 850 million ha, representing approximately 20% of the total arable land in the world (Batista Filho, 2007; IBGE, 2017). Availability of area combined with favorable climatic conditions for the development of several plants, results in enormous potential for the production of food at low cost (Ferraz; Felicío, 2010). Standing out worldwide for cattle breeding (ABIEC, 2016). Pasture-based ruminant feed is affected by seasonal fluctuations in forage production throughout the year. These fluctuations, associated with the lack of food planning of the properties, increase the costs with the acquisition of concentrates in order to supply the nutritional deficits of the animals in these critical periods.

As an alternative to the production of corn silage, roughage widely used by producers, the use of silage from other forages such as sugarcane, grasses and legumes has been highlighted. Conserved forages are important sources of energy for animals throughout the year, but they are extremely important in periods of low supply of natural or planted pastures (Bernardes; Chizzotti, 2012; Ribeiro Junior *et al.,* 2011).

Fluck *et al*. (2018), when studying ryegrass silage before and after four months of fermentation, observed that the bromatological composition of the pre-dried was similar to that of the green material, thus demonstrating the efficiency of the conservation method. However, the production of pre-dried products of this forage comes up against obstacles such as the high water content, and the lower DM production per hectare when compared to tropical forages. Also, information on losses throughout the production process and responses to fertilization under particular climate conditions are not disclosed in the scientific community.

In a study evaluating the quality of pre-dried marandu grass (BRS Piatã and BRS Paiaguás) with or without the addition of legume (Estilosante Campo Grande), it was observed that all pre-dried cattle presented satisfactory quality for the requirements of cattle in maintenance, even without the addition of legumes (Epifanio *et al*., 2016). In the pre-dried with the inclusion of 30% of legume, the fermentation process occurred adequately, which favors the obtaining of preserved forage with higher nutritional quality.

The conservation of Tifton 85 as pre-dried had good results according to the study by Neres *et al*. (2014). With a dry matter content of approximately 28%, the forage presented the best crude protein contents, pH and lower ammonia production. In the same work, evaluating the use of additives in the pre-dried, the researchers observed that the inclusion of soybean hulls increased the crude protein contents and the use of corn pounds promoted a reduction in the values of Neutral Detergent Fiber (NDF).

FACTORS INFLUENCING THE QUALITY OF PRE-DRYING

The challenge in ruminant feeding is to increase the intake capacity without harming the rumen, and the neutral detergent fiber (NDF) exerts a great interaction with intake, influencing the faster emptying of the rumen as the NDF content in the feed is lower (Velho *et al*., 2007). By characterizing the cell wall of plants, according to Van Soest (1994), ensuring pre-dried plants with levels of NDF similar to those of the original forage suggests efficiency in the conservation of its nutrients. This is a significant challenge in the production of preserved forages, due to the diversity of factors that can influence their nutritional value.

Initially, soil conditions, climate and fertilization act on forage quality, providing lower nutritional value the more adverse the conditions of the factors mentioned during plant growth. Sowing fertilization, especially in soils of medium/low fertility, stimulates forage production and nutritional value by providing a greater balance between the nutrients absorbed by the plants. In topdressing, the application of nitrogen under any fertilizer formulation increases in addition to productivity, the cell content of the plants, increasing the CP levels and reducing the cell wall. Relevant aspects in management decisions, as the structural organization of the plant and the tissues that constitute it, influence its digestibility, which is directly related to the bromatological composition (Carvalho; Pires, 2008).

After cutting, during the period in which the plants are exposed to the sun for drying, nutrient losses occur, because according to Van Soest (1994), heat causes losses in dry matter, and especially in protein digestibility due to the *Maillard* reaction. Forages whose temperatures do not exceed 5 to 8ºC at room temperature are considered to be free of protein losses caused by overheating (Kung *et al.,* 2018).

In this context, the shorter the time of exposure to the sun's rays of the forage after cutting, in order to achieve the moisture content necessary for silage, the less changes will be in the nutritional value of the plant. During pre-drying, the dry matter content is increased, a process that in addition to benefits for fermentation, also contributes to the reduction of enzymatic activity in plant cells, reducing nutritional losses.

After baling and plastic packaging of the pre-dried, the anaerobic environment is installed in the silo or rolls. This, associated with the DM conditions obtained in the pre-drying, provides conditions for the growth of lactic acid bacteria and inhibition of the growth of undesirable microorganisms (Nath *et al.,* 2018). Lactic acid bacteria cause a reduction in pH, which in the absence of oxygen ensures the preservation of the pre-dried forage.

During the storage of pre-dried forage, the presence of undesirable microorganisms is detrimental to the quality of the roughage, due to the competition for substrates with lactic acid bacteria (McDonald; Henderson; Heron, 1991). Also, in stored hays, nutritional changes were observed, such as the consumption of soluble carbohydrates, and in their depletion, the use of pentoses present in hemicellulose for the generation of energy by the remaining microorganisms. In pre-dried, a similar process occurs, but always allowed to fermentation conditions.

USE OF FERTILIZATION IN THE QUALITY OF PRE-DRIED FORAGES AND FERMENTATION

The application of fertilization in the soil during forage establishment aims to meet the nutrient needs of the plant, aiming to increase its productivity. According to Lopes *et al*. (2006), to reach one ton of dry matter, ryegrass needs 20-30 kg of Nitrogen, 6-10 kg of Phosphorus in the form of P2O5 and 25-35 kg of Potassium in the form of K_{2O}. Phosphorus (P) and Potassium (K) are essential elements in plant diet, playing important roles in plant metabolism. Phosphorus participates mainly in the development of roots and cell multiplication, which reflects on the productivity of cultures. Potassium, on the other hand, acts in physiological metabolism, such as in the regulation of the opening and closing of stomata, transport and storage of carbohydrates, synthesis of proteins and starch, and its functions are important in the induction phase of the plant (Tibau, 1983).

Among the minerals, nitrogen is the one that most limits the productive performance of grasses, as it is fundamental to plant growth, and therefore, they have high demands when seeking to increase forage production (Lupatini *et al*., 1998). This element is found in low concentrations in the soil, and mostly unavailable, requiring the practice of nitrogen fertilization prior to sowing, also called base fertilization. Nitrogen fertilization, when applied at the beginning of tillering, influences the productivity and growth speed of forages (Skonieski *et al.,* 2011). In the southern region of Brazil, where there are extensive areas planted with crops such as soybean and corn, it is common

among producers to take advantage of the residual effect of nitrogen fertilization provided to these summer crops, and there is no practice of base fertilization in these situations, which can negatively affect plant growth (Cassol *et al.,* 2011).

Cover fertilization at the beginning of ryegrass tillering responds to a higher density and faster growth of the plants, since the tillering time of this forage occurs in the fall, and due to the drop in temperature, it impairs the release of nitrogen originating from the soil (Carvalho *et al*., 2004). In the study by Pellegrini *et al*. (2010), evaluating the effect of four levels of nitrogen fertilization (0, 75, 150 and 225 Kg/N/ha) on the yield and quality of ryegrass pastures, found that the dry matter production per hectare (DM/ha) increased linearly with the evaluated N rates, with yields of 4203; 5696, 6851 and 7778 Kg/DM/ha according to the nitrogen increment. Pavinato *et al*. (2014), also found a linear increase in the yield of ryegrass, cv Barjumbo, in relation to nitrogen fertilization applications. It was observed in this work that the highest dose of fertilizer (120 Kg) used was the one that presented the maximum yield between the doses of 0, 40, 80 and 120 Kg/N/ha studied, with a production of 5250 Kg/DM/ha.

Soares and Restle (2002) observed that nitrogen fertilization provided the maximum dry matter production in triticale and ryegrass pasture at a dose of 300 Kg/N/ha (7877 Kg/DM/ha), and at a dose of 450 Kg of N/ha, there was a reduction in dry matter production (7662 Kg DM/ha), when compared to the dose of 300 Kg. The plant species used to make the pre-dried also influence the final quality of the material. Tropical climate grasses (C4), because they fix more carbon in their structure, have high dry matter yields, but the content of indigestible compounds is higher when compared to temperate climate plants (C3), due to the lower cell wall thickness of C3 grasses (Moreira, 2006).

USE OF RYEGRASS FOR PRE-DRYING

Ryegrass (*Lolium multiflorum*) is characterized by a forage species belonging to the Poaceae family. Its probable origin is the Mediterranean Basin, arriving in Brazil through Italian immigrants in 1875 (Floss, 1988). It is a temperate climate grass currently cultivated worldwide for various purposes (Son *et al*., 2019). In Brazil, it is quite widespread in the South Region, being used mainly as pasture (Medeiros; Nabinger, 2001).

It is an annual grass of route C3, with a fasciculated root system and cespitous habit, and can reach 1.2 meters in height, with cylindrical and erect stalks, whose height can reach 60 centimeters. Its leaves are thin, soft and shiny, with a width of 2 to 4 mm. The sheaths are cylindrical and the young leaves are curled. The ligule is short and the auricles are hugging. The inflorescence is through two rows of spikelets, 15 to 20 cm long, containing about 40 spikelets, with 10 to 20 fertile flowers per spike (Carvalho *et al*., 2004; Cauduro *et al*., 2007). The large-scale use of this forage is due to its

adaptation to the climate, with an ideal temperature for its development of around 18 to 20°C, high forage production, regrowth and nutritional quality (Pedroso *et al*., 2004; Pellegrini *et al*., 2010).

There is a huge supply of ryegrass cultivars on the market, and the main difference between them is genetic, classifying the varieties into diploid and tetraploid. The natural species of ryegrass are presented in the diploid form (2n=2x=14chromosomes) and through genetic improvement, chromosomal duplication was carried out, with the production of tetraploid varieties (2n=4x=28 chromosomes), with the objective of increasing the traits of agronomic interest. In this way, chromosomal duplication increases cell volume, and thus, cellular components such as water, soluble carbohydrate contents, proteins and lipids are increased, which leads to better digestibility indexes (Smith *et al.,* 2001; Balocchi; López, 2009). Thus, with a larger cell volume, the average weight of a thousand seeds in tetraploid cultivars is 3 to 4.5 g against 2 to 2.5 g for diploid cultivars (Balasko *et al*., 1995).

Ryegrass is a forage that has good palatability, with high values of protein, minerals and high digestibility. The flowering season is usually in September and has a great capacity for natural reseeding. Productivity varies with the management applied, and may exceed 10 tons of DM/ha (Carvalho *et al*., 2007). Due to the little diffusion of the practice of pre-drying of grasses in Brazil, studies related to this process are still scarce. The studies that refer to the preparation of pre-dried products have mostly the use of elephant grass and *Panicum maximum* for this purpose, due to the high availability of these forages in the country (Dantas; Negrão, 2010).

Ryegrass has great potential for the production of good quality pre-dried, because according to Tamburini *et al.* (1995), who evaluated the bromatological composition of different pre-dried crops (wheat, rye, triticale, barley and ryegrass), concluded that the digestibility and crude protein content in the pre-dried ryegrass was higher than the rest of the crops. Also in the same research, the authors observed that the cereals had higher dry matter yields than the pre-dried ryegrass. Conaghan; O'Kiely; O' Mara (2010) observed that the pre-dried of two perennial ryegrass cultivars (AberDart and Fennema) had better fermentations when the concentration of soluble carbohydrates in the dry matter was higher, which indicates that tetraploid varieties have greater potential for the production of pre-dried with high quality.

FINAL CONSIDERATIONS

The conservation of forages in the form of pre-dried is a potential alternative for the storage of quality forages. And among the factors that affect this quality, the forage species stands out, where ryegrass stands out for its nutritional value, in addition to fertilization and care in the process of production, obtaining and storing pre-dried.

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Landscape analysis to identify landforms from images generated by lidar technologies

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Urandir Fernandes de Oliveira[1], Fernanda Maria de Lima[2], Robson Leite[3], Saulo Ivan Nery[4] and Fernando Silveira de Oliveira[5]

ABSTRACT

This article presents the analysis of the landscape of peculiar reliefs called "chess", located in the north of the municipality of Apiácas, in the state of Mato Grosso. It is a residual relief from denudational processes typical of the Amazon Craton, identified in the region of the lower course of the Juruena and Teles Pires rivers. The intention is to contribute to the local geomorphological knowledge about the differentiation between drainage patterns and the rectilinear cuts located on the residual plateau of the Apiacás and Sucunduri. The images obtained with LiDAR and the geological and geomorphological information of the region were compared based on secondary data from IBGE surveys and other surveys. Based on the delimitation of sub-basins and micro-basins and observations about the surface circulation of water, it was possible to better understand the local relief. Peculiar structures were identified in the relief and indications that differentiate the drainage pattern with the sections identified in a "checkerboard" format.

Keywords: LiDAR, Drainage patterns, Landforms, Chess, Apiacás, MT, Amazon.

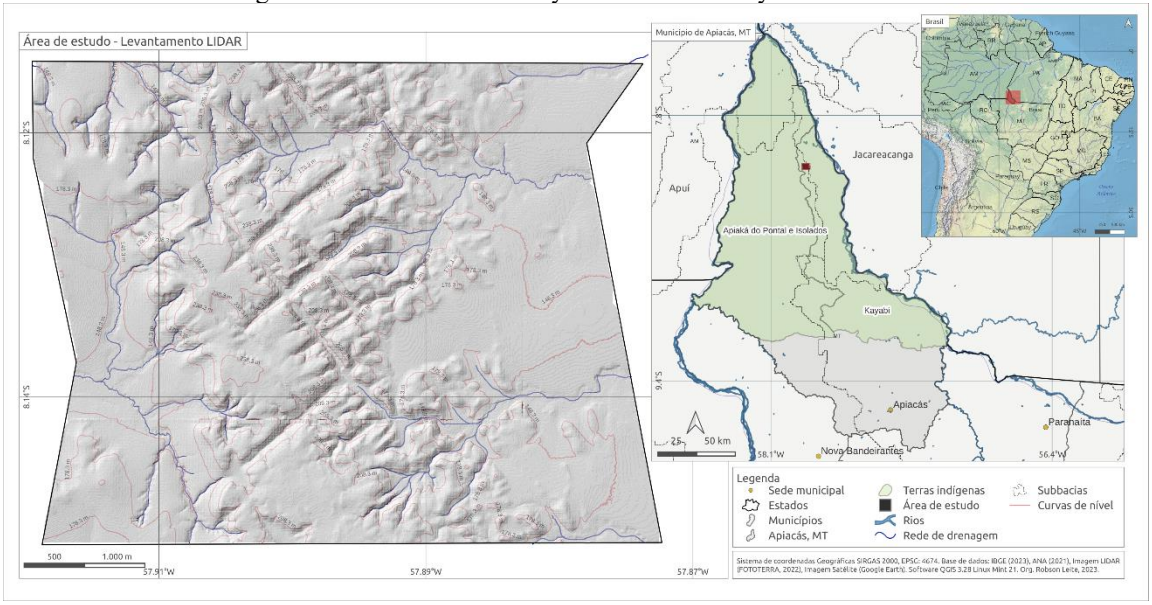
[1] President of the Dakila Civil Association
E-mail: urandirf2028@gmail.com
[2] Bachelor's degree in Mechanical Engineering with emphasis in Mechatronics from PUC/MG
E-mail: fernanda.lima@dakila.com.br
[3] Master in Physical Geography FFLCH/USP
E-mail: robsonleite.pro@gmail.com
[4] Master in Rural Studies/UFVJM
E-mail: saulo.nery@dakila.com.br-mail
[5] GlobalMapper Software Technician for Geoprocessing by Sigma Profissões
E-mail: fernando.andreazza@dakila.com.br

INTRODUCTION

The study area in question is located in the municipality of Apiacás, in the extreme north of the state of Mato Grosso, on the border with the states of Amazonas and Pará, at the confluence of the Juruena (to the west) and the Teles Pires (to the east) rivers. It is an area of high Amazonian vegetation density located in the northern portion of the Kayabi indigenous land[6]; close to the border with the Apyacá do Pontal and Isolados indigenous land[7]. As it is an inhospitable area, it was decided to analyze data collected by remote technologies that allow a greater understanding of the landscape without the need to travel by land to the site.

Data collection was done in an area of two thousand hectares using *LiDAR technology*[8], allowing a detailed survey with the production of a digital model of the terrain capable of differentiating the forms contained in the landscape, thus making it possible to identify peculiar forms in the local relief in relation, above all, in the identification of differences and similarities in drainage patterns. The relief of the studied area is in a "checkerboard" format, with the outline of "*grids*" (orthogonal lines, perpendicular to each other) that are not directly related to any drainage pattern (Figure 1). The number of scientific studies using *LIDAR* has been growing, especially in geomorphological analyses (ARAUJO et al, 2022), which can provide new interpretations, refinement of research carried out so far, and new details about the modeling of environmental systems.

Figure 1: Location of the study area. Initial survey with LIDAR.



6 Land traditionally occupied by the Kaiabi ethnic group, regularized and located in the municipalities of Apiacás in the state of Mato Grosso and Jacareacanga in the state of Pará.

7 Indigenous land traditionally occupied by the Apiaká ethnic group and isolated peoples, delimited and located in the municipality of Apiacás, state of Mato Grosso.

8 *LiDAR (Light Detection and Ranging)*, laser scanning to obtain detailed topographic information, even on mountainous and densely forested surfaces, greatly increasing the capacity for data collection.

METHODS AND MATERIALS

For this study, we used the Digital Elevation Model (DM) from the remote sensing technology with the LiDAR (*Light Detection and Ranging)* light detection and ranging system rendered in *the Global Mapper software*, version 23.1. It is a point cloud MDE image with 145 layers and a resolution of 8 pulses per square meter. We do not use Digital Surface Modeling (MDS) because of the vegetation density at the site. The final maps were prepared in the QGIS 3.28 software, adopting the SRC (Coordinate Reference System) SIRGAS 2000, Zone UTM 21S, EPSG 31981.

Geographic Information Systems (GIS) are used for the analysis and planning of landscapes and the environment (LANG and BLASCHKE, 2009). For the composition of the landscape studies, a survey of secondary data from geological and geomorphological research developed in the region was used. The presence of some geological faults and structural surface lineament to the north and northwest of the studied area were identified on a regional scale, according to data from IBGE (2017) and ANM (2014); we also sought to identify the natural drainage pattern based on the LIDAR images, comparing them with the maps and topographic maps available on the Brazilian Army website (BDGEx, 2022).

We compared the rectilinear shapes identified in the relief with the local drainage pattern (CHRISTOFOLETTI, 1980; SUGUIO and BIGARELLA, 1990). Data regarding the depth, width and extension of the cuts were also collected, which were organized and analyzed here.

RESULTS AND DISCUSSIONS

According to the studies consulted (STUDART et al., 2006; PIEROSAN et al., 2019; UHLEIN et al., 2015, LACERDA FILHO et al., 2004) a closer geological fault was identified, the *Cachimbo Graben*[9] , located more than one hundred kilometers in a straight line from the study area, characterized by being a megastructure with a NW-SE direction. With a geological base on rocks from the Beneficent Group, from the Igarapé Ipixuna sedimentary formation, composed of sandstone quartz (CPRM, 2014), the Apiacás and Surunduri plateau is characterized by a set of mountains that form a watershed of the tributaries of the Teles Pires (to the east) and Juruena (to the west) rivers, with reliefs dissected into ridges, hills and spikes with flattened tops, embedded valleys and ravine slopes, comprising the geomorphological region of the residual Plateaus of the Southern Amazon (IBGE, 2017).

The hot and humid equatorial climate predominates in this region. The Brazilian Amazon is one of the most humid forests in the world and the action of water is a primary factor for the

9 According to Guerra and Guerra (2006, p. 286), *Graben* or fossa refers to a depression elongated by a series of steps produced by parallel faults.

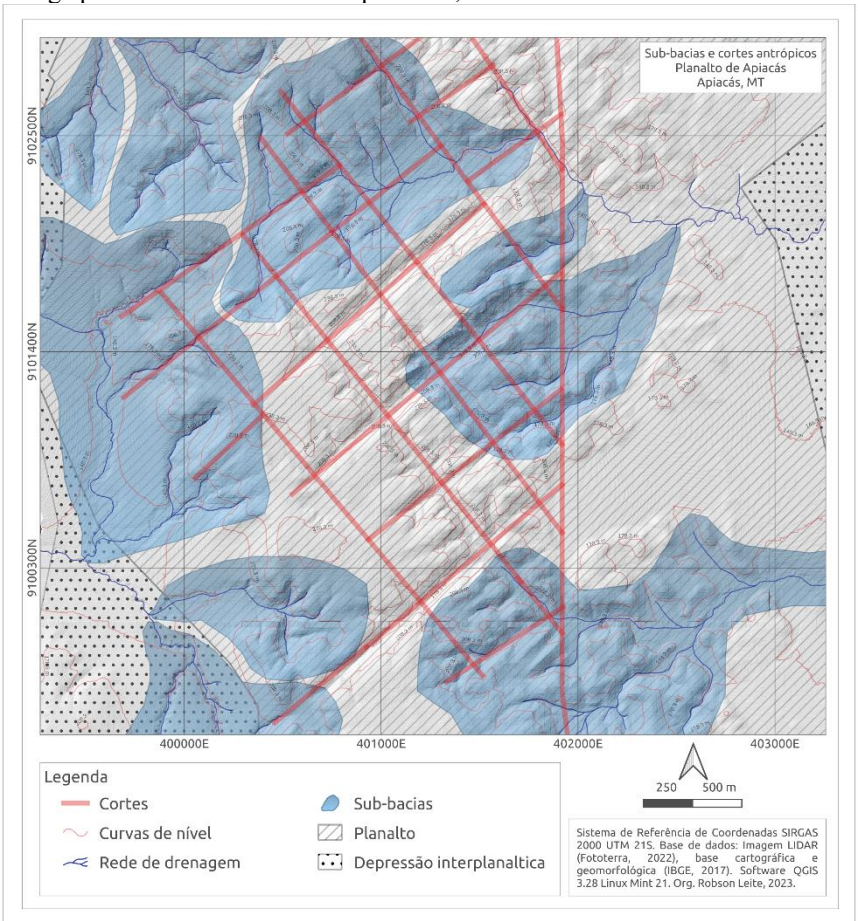
processes of construction and alteration of the relief, considering that the study area has a high level of precipitation. With annual rainfall of 2,750 mm, maximum rainfall occurs in January, February and March; and the minimum rainfall occurs from June to July. The average annual temperature is 24ºC, with a maximum of 40ºC. All this precipitation favors the formation of large rivers and a dense drainage network.

It is noted that the natural pattern of the drainage network on the slopes of the plateau, printed in dendritic form, occurs mainly in the lower parts of the relief to the west. At the top of the plateau, to the east, in the higher areas of the area's relief, we identified rectilinear cuts that are different from the river valleys sculpted by natural erosion and that may be associated with other processes. In official maps and charts (IBGE, 2017; ANA, 2021; BDGEx, 2022) no type of drainage consistent with such cuts or that the drainage network is classified as rectangular or parallel was not identified. Drainage channels were identified, most likely formed from the surface runoff of rainwater, located at the bases of the identified cuts.

Evidently, the formation of rainwater runoff sites was formed at the base of the cuts, however, not all of them have these marks. Some marks are close to the drainage headwaters. Therefore, the cuts in the terrain contributed to increase the collection of rainwater from the highest parts of the relief.

To differentiate the cuts in the drainage network, it was decided to delimit some sub-basins and micro-basins (GOMES, BIANCHI, OLIVEIRA, 2021) and that the watershed is an important geomorphological unit to understand drainage patterns and water flow (LEOPOLD, WOLMAN, MILLER, 1964; CHORLEY, 1969; CHRISTOFOLETTI, 1980). This delimitation considered the watersheds between the tributary rivers and the main rivers, which demonstrated that certain cuts are not directly associated with the basins and the dendritic drainage pattern (Figure 2).

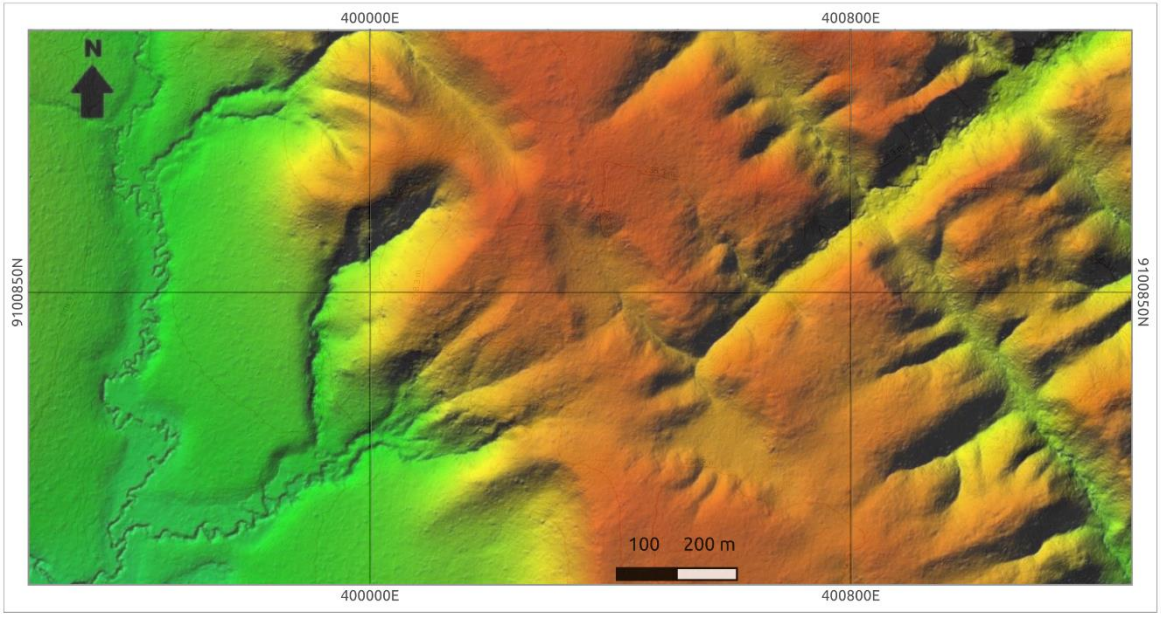
Figure 2: Delimitation of sub- and micro-basins and identification of peculiar sections in the relief. The cuts do not follow the dendritic drainage pattern and the basins. Map at 1:20,000 scale.



By delimiting some drainage sub-basins that make up the residual plateau based on the topography of the relief, it is possible to perceive that the cuts in the terrain are not limited to the domain of the drainage basins that form the headwaters of watercourses in the area. It is also noted that the cuts are not topographically confused with the river valleys, as cuts were identified that exceed the limits of two or more drainage headwaters that form the sub- and micro-basins.

The Juruena River, to the west, and the Teles Pires River, to the east, serve as the local base level for the tributary rivers that originate on the residual plateau. The east side of the plateau features more eroded slopes and a vast plain on the banks of the Teles Pires River. The west side of the plateau, in turn, has steeper and more conserved slopes (Figure 3). This points to the process of regressive erosion, which is the "work of wearing down the bottom of the riverbed being done from downstream to upstream" (GUERRA and GUERRA, 2006), but that to the east this process is more intense. For Ross (1991) some plateaus with flat or flattened surfaces are found on the edges of sedimentary basins sculpted by circumdenodational processes frequently found in the Amazon, and these terraces are associated with regressive erosion in drainage headwaters or parallel retreat of slopes.

Figure 3: LiDAR image detail. Difference between rectilinear formations to the east (in yellow and red), over the residual plateau, and the river valleys and their respective drainage pattern to the west (in green).



From these cuts, it can be seen that there is a certain average depth that was identified. In a preliminary analysis, we noticed that the cut apparently deepens in the top areas and becomes shallower in the middle and lower portion of the slope. There is a main cut in the eastern portion that extends for about eleven kilometers in a north/south direction. We use this section as a reference for the structure as a whole, and as a way to understand the arrangement of the other perpendicular sections.

Data were collected that indicate the sinuosity of the cuts. Thus, it was identified that of the total of twenty-nine cuts that form this "checkerboard" in the relief, only four presented sinuosity and the remaining twenty-five are rectilinear. The classification by sinuosity was performed in the *Global Mapper software*. Fifteen sections had a southwest/northeast direction, eight had a northwest/southeast direction. Six sections had a north/south direction, and another six had an east/west direction.

Figure 4: Table with collection of measurements of the cuts.

Corte no Terreno	Distância	Rumo	Sentido	Sinuosidade	Medidas Altitudes a cada 500m						
Principal	11.153 km	176° 55' 07.193"	Norte/Sul	10.201.586	147.40 m	145.97 m	134.58 m	134.52 m	142.17 m	149.09 m	160.88 m
1	1.538 km	64° 44' 40.174"	sudoeste/nordeste	1	135.24 m	173.39 m	193.76 m	189.48 m			
2	1.159 km	55° 38' 16.567"	Sudoeste/Nordeste	1	160.21 m	151.37m	194.29 m				
3	1.646 km	54° 09' 40.695"	Sudoeste/nordeste	1	142.58 m	159.98 m	177.85 m	208.07 m			
4	1.35 km	55° 22' 07.431"	Sudoeste/nordeste	1	171.58 m	177.95 m	155.94 m	148.81 m			
5	875.87 m	57° 35' 39.253"	sudoeste/nordeste	1	155.49 m	202.69m	165.73				
6	2.059 km	51° 36' 34.398"	Sudoeste/Nordeste	1	160.52 m	159.64 m	194.36 m	223.45 m	150.95 m		
7	585.53 m	54° 30' 51.757"	sudoeste/nordeste	1	171.22 m	151.04					
8	472.45 m	47° 11' 27.067"	sudoeste/nordeste	1	241.52 m	151.85					
9	1.558 km	49° 02' 12.497"	Sudoeste/nordeste	1	156.33m	178.66 m	205.77 m	239.79 m			
10	1.666 km	50° 34' 04.814"	Sudoeste/Nordeste	1	172.54 m	171.59 m	192.48 m	230.42m			
11	1.242 km	52° 07' 22.574"	Sudoeste/Nordeste	1	171.17 m	183.55 m	212.24 m	233.56 m			
12	1.896 km	50° 34' 04.830"	Sudoeste/nordeste	1	168.96 m	165.63 m	172.21 m	185.31 m	166.85 m		
13	706.06 m	57° 24' 27.503"	Sudoeste/nordeste	1	159.31 m	189.61 m					
14	3.195 km	84° 41' 39.118"	Leste /Oeste	10.053.471	135.49 m	156.09 m	176.36 m	210.25 m	169.75 m	228.26 m	180.39 m
15	851.07 m	142° 56' 28.147"	noroeste/sudeste	1	156.96 m	138.22 m	134.33 m				
16	2.252 km	145° 38' 09.722"	Noroeste/Sudeste	1	229.51 m	220.83 m	207.47 m	208.41 m	140.35 m		
17	2.211 km	143° 33' 36.251"	Noroeste/sudeste	1	240.45 m	191.97 m	163.71 m	152.66 m	165.02 m	149.20 m	
18	2.296 km	141° 39' 15.555"	Noroeste/sudeste	1	229.28 m	162.03 m	161.89 m	223.54 m	195.92 m	165.94 m	
19	2.598 km	142° 52' 05.436"	Noroeste/Sudeste	1	199.49 m	188.59 m	206.41 m	184.07 m	171.25 m	163.00 m	
20	2.544 km	141° 29' 39.018"	Noroeste/sudeste	1	182.76m	203.55 m	203.01 m	185.87 m	166.66 m	155.17 m	156.75 m
21	2.544 km	140° 11' 33.329"	Noroeste/sudeste	1	154.46 m	203.64 m	231.16 m	215.44 m	228.78 m	189.71 m	225.16 m
22	1.912 km	138° 46' 15.196"	Noroeste/Sudeste	1	191.47 m	194.08 m	184.93 m	151.91 m			
23	1.421 km	163° 13' 59.662"	Norte/Sul	1	210.04 m	208.91 m	210.22 m	210.22 m			
24	1.809 km	169° 13' 11.203"	Norte/Sul	1	170.96 m	210.90 m	194.13 m	192.34 m	214.81 m		
25	1.745 km	172° 04' 10.371"	Norte/Sul	1	172.92 m	192.98 m	159.11 m	179.44 m	161.77 m		
26	2.311 km	175° 25' 03.685"	Norte/Sul	10.063.752	163.88 m	164.36 m	165.00 m	181.04 m	168.38 m	196.43 m	
27	975.19 m	174° 34' 42.994"	Norte/Sul	1	138.88 m	151.35 m	174.49 m	188.82 m			
28	1.885 km	46° 54' 14.264"	sudoeste/nordeste	10.153.214	217.00 m	194.45 m	225.61 m				
29	1.198 km	55° 28' 11.984"	sudoeste/nordeste	1	178.73 m	205.79 m	180.77 m	199.68 m	223.99 m		

It is clear that the relief marks here called cuts are rectilinear enough for the software not to detect sinuosity in most of the traces, also draws attention to the number of cuts with exactly the same direction, most of them being Southwest/Northeast. Very intriguing facts for geological or geomorphological structures that exist in the Amazon environment, where the rainfall force over the years wears down the relief, sculpts channels and transports sediment in always very large proportions, both due to the vastness of the Amazon territory and due to the amount of rainfall and consequently drainage.

It is also observed that due to the subsurface flow of water, some concave shapes can be infiltration and/or drainage points. Even so, they are very peculiar forms and the data listed here are results of remote analysis and preliminarily made, and the possibility of complementing part of the information, or confronting the data collected by LiDAR technology with the reality of the field survey, should be considered.

FINAL CONSIDERATIONS

It is known that there are numerous reliefs with peculiar formations, whether in the form of dome, landing, table, among others, and that they are being reviewed and reinterpreted especially with the use of new technologies. The dense Amazon forest is still one of those places, whose knowledge in the scale of detail is still restricted, and that it must also be taken into account that it is a humid tropical environment with intense weathering and pedogenization, making the relief even

more complex. The presence of rectilinear cuts that differ from the erosive patterns in the studied area may indicate new readings about the residual relief located in the north of the municipality of Apiacás, in Mato Grosso. It is evident that the erosive patterns acting in the area, for millions of years, have built very different forms from those identified by the *LiDAR sensor.* The images generated by this sensor help us to improve the understanding of the erosive processes of the present, as well as to list hypotheses about the formation of peculiar "chess" shaped reliefs.

In these places, so far inhospitable for detailed scientific research, it is very likely that with the development of new studies, we will also be able to identify new plant and animal species, as well as unprecedented archaeological structures. Considering that the area is little studied and the results demonstrated by the use of *LiDAR* technology indicate paths to the continuity of the research. In any case, it is worth noting that definitive proof will only be possible from a field research campaign that identifies material traces *in loco*, such as faults and fractures, types of soils and springs.

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A framework for utility marketing

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Renato Emanuel Gomes da Silva[1] and Silvio Augusto Minciotti[2]

ABSTRACT

The general objective of this work is to present a framework containing the steps that enable the implementation of Public Services Marketing. Public Services Marketing can be applied to the actions of government institutions at the federal, state and municipal levels, with a direct impact on the quality of life of the population, where the public sector seeks to facilitate access to public services, meeting social needs effectively. Therefore, according to Cezar (2019), the main function of Public Services Marketing is to allow society to have a more participatory role in public life and enjoy their rights as citizens, having access to all areas of public policy. The method adopted in this field research was the jury of experts, which according to Davis (1992) is widely used to evaluate instruments and procedures. The use of expert opinion in qualitative research aims to verify more accurate information in order to develop or improve the questionnaires used to collect data, as well as roadmaps for implementing managerial activities. The determining variables for the implementation of Public Services Marketing composed the framework, submitted to a jury of experts, to complement and validate the field research and is presented as a product for this work. The results offered by the experts' answers were analyzed, verifying an expressive agreement with the composition of the framework submitted to evaluation. It was observed that most of the comments presented endorsed the acceptance of the original text. Due to its pertinence, four suggestions were incorporated into the composition of the framework. Thus, there is a contribution to academia and the Public Administration sector about this unconventional application of Marketing, called Public Services Marketing, in the set of the theoretical framework and framework presented.

Keywords: Public Services Marketing, Public Management, Citizen, Government, Framework.

[1] Doctor of Business Administration
Institution: Municipal University of São Caetano do Sul
E-mail: renatoemmanuel@hotmail.com
[2] Doctor of Business Administration
Institution: Municipal University of São Caetano do Sul
E-mail: silvio.minciotti@online.uscs.edu.br

INTRODUCTION

For almost a century, traditional Marketing has been expanding, expanding its field of study, as well as receiving new definitions.

Marketing activities in both the public and private sphere are aimed at managing exchange processes. In 2003, Kotler and Armstrong (2003) stated that for the exchange to occur, someone offers something in exchange and obtains a product or service that one wants. Therefore, the extension of the concept of exchange can include more complex exchanges, enabling the use of Marketing in other relevant situations in which there is supply and demand, as is the case of the public sphere (Kotler and Armstrong, 2003).

Marketing literature is often faced with a range of different terms that, however, refer to the same concept or application. This also occurs with the application of Public Services Marketing, the object of this work, which is mentioned in the bibliography as Public Marketing or Public Administration Marketing (Silva, Minciotti, and Gil, 2021). Also frequently, this same approach to applying Marketing strategies is mistakenly referred to as Marketing of Cities, Places and Regions, or even Political or Electoral Marketing.

Thus, considering the peculiarities of these exchanges, Cezar (2019, p. 17) proposes to organize them within the scope of Public Marketing, which now encompasses four applications:

1) Marketing of Public Services, applied to the planning and implementation of the provision of services aimed at the community, including the offer and promotion of services of public organizations, the planning and implementation of public policies, the offers of social programs, and institutional dissemination;
2) Social Marketing, aimed at the exchanges and changes necessary for the implementation of ideas and social causes;
3) Political Marketing whose emphasis is on party activities and electoral strategies; and
4) Marketing of Places with a focus on the sustainable development of cities, regions, including the conquest of business investments, new residents and increase in tourism.

The main objective of the first type of Public Marketing, called Public Services Marketing, is to shorten the distance between the organization and the public services to be provided to citizens. Many people are still unaware of the services that certain public organizations offer and how to access them.

Therefore, according to Cezar (2019), the main function of Public Services Marketing is to allow society to have a more participatory role in public life and enjoy their rights as citizens, having access to all areas of public policy.

However, Public Services Marketing goes beyond the choice of strategy and means of communication to be used; it organizes the offer of these services, also composed of the other

controllable variables of Marketing, here characterized by the definition of the services to be provided, the monetary costs or not that the citizen should have, the places where the services will be made available, the training of the people involved in the provision of the services and definition of the processes to do so and the physical evidence that brings together the tangible elements used in the provision of services.

The proposal also establishes a mechanism for identifying citizens who have used its services, as a means of establishing a positive image and enhancing the offer of new services (Schultz *et al.*, 1993).

For Cezar (2019), this type of marketing is very common when trying to emphasize relevant aspects of the institution, such as the quality of teaching at the Public University or the wide coverage of services provided by public banks, for example. According to the same author, even if some public organizations are primarily responsible for the provision of certain types of public services, these organizations are practically not impacted by competition.

From this perspective, citizen service has become the basic mechanism for public satisfaction with the services provided (Kotler and Lee, 2008). When citizen participation in the public service is precarious, resulting in many queues and high service times, working methods to reduce these problems can be inserted, in addition to Marketing concepts to improve the performance of these public sector organizations and achieve changes.

Therefore, the general objective of this work is to present a *framework* containing the steps that enable the implementation of Public Services Marketing.

UTILITIES MARKETING

Public Services Marketing, as previously exposed, admits that society legitimately participates in public life and enjoys its rights as citizens, in addition to having access to all areas of public policies (Cezar, 2019).

According to Silva *et al.* (2014), it was observed that the government lost the ability to invest in the state's production sector and, at the same time, there was an increase in *the deficit*, which led to the removal of the basic obligations of the state to offer quality public services to the population to a secondary level. In addition to helping to dispel the myths that call into question the relevance of the application of Marketing to the public sphere, actions aimed at adapting Marketing concepts, strategies and practices to this sphere can prove to be a solution to increase the efficiency and effectiveness of the public sector. Also for these authors, the main idea of public sector Marketing is the intervention to promote exchanges through educational, health, safety, cultural, leisure, social and economic programs, aiming to restore the development of society.

According to Ţigănaş *et al.* (2011) and Silva *et al.* (2014), public sector institutions are turning to private sector management as a way to identify strategies, tools, and practices that enable them to improve the efficiency and effectiveness of their operations, although public sector professionals still raise some resistance.

Thus, it can be deduced that the adoption of Marketing strategies allows public sector professionals to promote significant improvements in the conditions of supply of products and services, acting with greater adequacy to the target audience they wish to reach.

Public Services Marketing deals with all activities in the public sphere in a general context, from the federal to the municipal government, while praising the bodies linked to each of these instances. It is the objective of Public Services Marketing to ensure that the collective purposes are achieved, with the use of available resources, through the good management of these resources.

According to Alemán, Gutiérrez-Sánchez and Liébana-Cabanillas (2018), the Marketing of Public Services has a direct impact on the quality of life of the population that seeks access to public services, so that their needs are met in a transparent, effective and efficient way, observing the prerogatives of the budget.

Marketing has been noticed in the public sector in a more evident way, because what happens in this sphere is very much identified with traditional Marketing. After the public sector reforms in the early 1980s, governments began to embrace the experiences and practices of companies, such as identifying mechanisms for greater profitability and verifying competition, which has led many public institutions to act with an emphasis on the customer, that is, the population (Proctor, 2007).

Improving the quality of services provided by the public sector provides increased productivity and reduced costs. Therefore, the population can be treated as a client, as long as the public sector emphasizes the orientation for the citizen/client in its provision of services.

According to Garraza (2012), since the government of British Prime Minister John Major, in 1991, with its letter to the citizen, countries such as the United States and Canada, as well as some European nations, have established rules to endorse the population's satisfaction with quality public services, corroborating a new identity, in which the population began to be identified as customers. However, according to the same author, this approach has raised criticism, according to which the public sector should not adopt the perspective of correspondence between citizen and customer in the same way as this occurs in the Marketing actions of the private sector.

However, studies indicate that it is possible to combine these two factors, that is, a public sector that acts responsibly and, at the same time, provides quality services, aiming to increase the satisfaction of its population, which pays for them.

Thus, satisfied customers have expectations met and delighted customers have their expectations exceeded, according to Kotler and Keller (2012), who ratify that satisfied customers

remain loyal for a long time, returning to purchases and speaking positively of the company or organization providing the services.

Therefore, a population satisfied with the public sphere will tend to identify a provision of quality services with regard to meeting the needs and desires of taxpayers in the short, medium or long term.

Kotler and Lee (2007) and Silva and Minciotti (2021) point out that the Public Administration tends to learn from what companies practice in terms of market actions, however, the public sector should not copy the concepts, tools, and methods without making the necessary adjustments to meet the specificities and characteristics of the sector in question.

METHODOLOGY

The method adopted for this work was the jury of experts, which according to Davis (1992) is widely used to evaluate instruments and procedures. The use of expert opinion in qualitative research aims to verify more accurate information in order to develop or improve the questionnaires used to collect data, as well as roadmaps for implementing managerial activities.

The expert jury method consists of collecting authoritative opinions on specific and understudied topics. In addition, this is a research technique that can be used in the areas of Psychology, Administration and Social Sciences (Pinheiro *et al.,* 2013).

The jury must be formed by recognized qualified specialists, with deep and solid knowledge, having the ability to make decisions and give an opinion on the issues analyzed with the same rigidity as other scientific methods. The expert expresses an idea through their opinion, which can be combined with a specific point of view on a related topic to guide decision-making, but this does not mean that their word is final or definitive on that topic. Experts must answer the questions that constitute the instrument built on the basis of their previous knowledge (Meyer and Booker, 2001). Therefore, the interpretation of the questions leads to their approval.

Therefore, it is not necessary to involve many experts in this validation. It is essential that they master what is being studied, which is not related to the statistical representation of any population.

The participation of experts is intended to ascertain the content and items of the instrument, in addition to verifying the suitability of this instrument for the use for which it will be intended. After this validation, the instrument can be used by the market (Licona *et al.*, 2014).

According to Neto (2008), the method requires specialists to have marketing, political and technical skills, which are relevant requirements for the excellence of the evaluation process.

To avoid the effects resulting from the contact between the specialists, the professionals were consulted individually, in order to evaluate the hypotheses from a more rigorous perspective (Meyer and Booker, 2001).

Therefore, the method presented is able to examine and study the problems discussed and validate the *proposed framework*, which was born in the work of Silva (2021), after intense analysis of the literature, complemented by research with 10 specialists in the areas of Public Administration and Marketing.

DATA ANALYSIS AND DISCUSSION

The specialists were chosen according to their adherence to the theme, as well as their knowledge about Public Administration and Marketing. It is noteworthy that the specialists in this sample are public managers and academics. One of them occupies both positions. The jury of experts is composed of 10 members, and the public agents that make it up are from the Public Administrations of the Greater ABC region of São Paulo. The summary of the profile of each one is presented in Table 1 below:

Table 1 – Profile of the Experts

SPECIALIST	PROFILE
1	Post-Doctorate. Academic. Communication and Marketing Specialist
2	Doctor. Academic. Communication and Marketing Specialist
3	Master. Market Professional in the area of Communication and Marketing
4	Doctor. Academic. Coordinator of the Public Management Course of a Federal Institution
5	Municipal Secretary
6	Municipal Secretary
7	Municipal Secretary
8	Doctor. Academic and Municipal Secretary
9	Municipal Secretary
10	Municipal Secretary

Source: prepared by the Authors.

In order to preserve identity, the specialists will be identified in numerical order. It should be noted that the occupation was informed by the members of this jury of experts and this order observed the feedback of the *framework* proposal sent for analysis. Therefore, whoever returned first is identified as Specialist 1 and so on until the ten (10) specialists are finished. Experts should respond to the proposed *framework* for Utilities Marketing within a three-column figure after each Stage or Activity. These three columns are so that each specialist could: accept, not accept or partially accept that activity. The choice should be made with the simple indication, however, in the case of partial acceptance or rejection, a justification or suggestion should be presented, which was optional for cases of acceptance. The Expert Jury participated in this field research between the months of September and October 2021.

The *Framework* was composed of a schematic representation and an operational description, which were presented to the jury of experts, according to the following analysis.

The opinions of the experts regarding the schematic representation are summarized in Table 2 below:

Table 2 – Evaluation of the Schematic Representation of the *proposed* framework

SPECIALIST	EVALUATION	COMMENTS
1	ACCEPTS	"The scheme is clear and didactic, without it seems to me that there is a need for any type of editing"
2	ACCEPTS	"Very clear, didactic and objective"
3	ACCEPTS	NO COMMENT
4	PARTIALLY ACCEPTED	"I suggest that you develop the operational definitions further at the beginning, to make it easier for the reader to understand"
5	ACCEPTS	"Schematic representation encompasses the basic and necessary requirements, in an objective way"
6	PARTIALLY ACCEPTED	"Presents the action plan in a structured way, covering the various aspects and details before execution"
7	ACCEPTS	NO COMMENT
8	PARTIALLY ACCEPTED	"Threats and opportunities may not make much sense for the public administration. Many public policies have a universal character, they are not subject to the same dynamics as private administration"
9	ACCEPTS	NO COMMENT
10	ACCEPTS	"Very didactic presentation"

Source: prepared by the Authors.

Thus, as shown in Table 2, seven of the experts accepted the graphic representation that was proposed for the *framework* in question and three experts partially accepted. It is observed that four specialists, when they accepted, made comments, as shown in Table 2. Three experts accepted, but did not comment, and three experts partially accepted, as shown in Table 2. Specialist 8 made an isolated comment, which does not correspond to any note in the literature. Therefore, there were no changes to the schematic representation because the comments permeated the didactic, clear and objective characteristic that was praised by the specialists. Subsequently, the experts were invited to express their opinions in view of the operational description of the *framework,* which is divided into three stages – planning, implementation and forms of evaluation and control, with the first stage presenting six activities.

EVALUATION REGARDING ACTIVITY 1 OF STAGE I: DESCRIPTION OF THE PUBLIC POLICY OBJECT OF THE MARKETING PLAN

Texto Proposed:

"The starting point for the preparation of the Marketing plan is the specification of the action to be developed and the public policy to which it is linked. Example: a housing program that aims to provide conditions for a certain population to access their own housing".

Table 3 – Evaluation of Activity 1 of Stage I

SPECIALIST	EVALUATION	COMMENTS
1	ACCEPTS	"It is clear and objective"
2	ACCEPTS	NO COMMENT
3	ACCEPTS	"As a suggestion, this title "Description of public policy..." can be called something that refers to the projects inserted in the public policy in question"
4	ACCEPTS	"In the text of the Operational Description it is said about the "Action" to be developed, I am in doubt if the word "action" is the best to be used, because I understand that the Marketing action will happen, or not, at the end of the process. But I agree with the starting point"
5	ACCEPTS	"The description of the Public Policy should address details, so that we can differentiate the various actions"
6	ACCEPTS	NO COMMENT
7	ACCEPTS	NO COMMENT
8	PARTIALLY ACCEPTED	"The starting point should be the target audience, to whom I am going to speak"
9	ACCEPTS	NO COMMENT
10	ACCEPTS	NO COMMENT

Source: prepared by the Authors.

Thus, according to Table 3, nine experts validated activity 1 and only expert 8 partially validated it, but his comment refers to activity 2 of step 1, commented below. It is noteworthy that among the nine experts who accepted, five made comments and four other experts did not comment on this proposal called Description of the Public Policy object of the Marketing Plan. The comments made by the five experts who accepted the proposed text only ratified it and were therefore not incorporated.

EVALUATION REGARDING ACTIVITY 2 OF STAGE I: DEFINITION OF THE TARGET AUDIENCE

Proposed Texto

"The target audience will be defined by the set of characteristics, which clearly identify the profile of the people involved in the action, whether they are decision-makers, influencers or beneficiaries.

Therefore, it is necessary to segment the population with the purpose of identifying these target segments, understanding that a segment is the set of people with similar characteristics in relation to the public policy, which is the object of the proposed action. The target audience will correspond to one or more of these identified segments, which need to be quantifiable, significant and accessible.

The definition of these target segments has a direct impact on determining the audiences to be considered, enabling much more clarity on where, when, how and especially, for whom to implement a Marketing Plan.

The variables that can be used in this segmentation process are the following:

a) Demographic - used to divide this universe of people, according to population variables, such as age, sex and/or gender (when this differentiation is necessary), occupation, level of education, income, family size, race, generation, social class, nationality, place of birth and religion;

b) Geographic - makes it possible to divide the universe of people involved, directly or indirectly, according to the geographic regions to which they belong, such as: city, subdistrict, neighborhood, street, etc.;

c) Psychographic - these variables allow the total set of people involved to be divided into segments, based on psychological/personality traits as well as lifestyles and values;

d) Behavioral – it is considered the analysis of people's behavior and attitude about a service or subject that one wishes to address. Some examples of these variables are: form of adherence to the action proposal, occasion and rate of use, expected benefits, degree of adherence to the campaign proposals, among other possibilities of behavior in relation to the objective of the action being implemented.

Demographic and geographic variables will be present in most segmentation processes. However, behavioral and psychographic measures will be useful when a refinement in the definition of the target audience is justified.

At the end of the segmentation process, each Marketing action will have its target audience defined and chosen in accordance with its purposes, remembering that the more precise and focused a characterization of the target audience profile is, the better the conditions for planning and executing the steps that make up the Marketing plan.

It is necessary to keep in mind that the population is not a homogeneous whole, being composed of different groups of individuals, each with different expectations of benefits".

Table 4 – Evaluation of Activity 2 of Stage I

SPECIALIST	EVALUATION	COMMENTS
1	ACCEPTS	"I liked the explanations and attributions of four segmentation criteria, with the proper refinement of psychographics and behavior"
2	ACCEPTS	"I agree with the segmentation criteria"
3	ACCEPTS	"It is interesting to point out in some way that psychographic and behavioral variables can provide public management with information that contributes to the improvement of services and products for the population, and also in the development of strategies and public policies"
4	ACCEPTS	"Very good and clear definitions"
5	ACCEPTS	"MKT strategies must take into account the mark that the Administration has, or that it has to achieve. Ex. The best public education in the country or The state that vaccinated the most"
6	ACCEPTS	NO COMMENT
7	ACCEPTS	NO COMMENT
8	PARTIALLY ACCEPTED	"Factors such as income, education and geographic location of the residences must also be taken into account"
9	ACCEPTS	"From the point of view of Secretariat X, for example, this stage is essential, although we have more relationship with the beneficiary public, where the issue of the territories where this population resides is paramount, having seen their life linked to it and the proposals that result from it"
10	ACCEPTS	NO COMMENT

Source: prepared by the Authors.

After the evaluation of this activity 2 of Stage 1, called Definition of the Target Audience, nine experts accepted and only one of them partially accepted. Among the experts who accepted the text proposed for this activity, only six expressed their agreement in comments, reinforcing its acceptance. The expert who partially accepted made his comment, as highlighted in Table 4, suggesting the inclusion of segmentation variables that are already contained in the proposed text, that is, the comments of experts 3 and 8 are already considered in the text. It should be noted that the comment of expert 5 is not related to this activity under analysis.

EVALUATION REGARDING ACTIVITY 3 OF STAGE 1: DIAGNOSIS REGARDING THE IMPLEMENTATION OF THE PUBLIC POLICY IN QUESTION

Proposed Texto

"This diagnosis includes the identification of threats and opportunities that present themselves, in view of the proposed action. To this end, an internal analysis must be carried out, identifying the strengths and weaknesses, as well as an external analysis containing the favorable and unfavorable situations to be faced. From the joint analysis of these internal and external data, threats and opportunities can be identified, which will serve as a reference to establish the objectives and action programs to be implemented.

It is important to note that favorable situations and unfavorable situations are not automatic synonyms of opportunities and threats. Thus, in order to identify the presence of an opportunity or the existence of a threat, it is essential to confront the external favorable and unfavorable situations with the strengths and weaknesses of the Administration so that it can be concluded whether a threat or opportunity actually occurs".

Table 5 – Evaluation of Activity 3 of Stage I

SPECIALIST	EVALUATION	COMMENTS
1	ACCEPTS	NO COMMENT
2	ACCEPTS	"Wouldn't it be interesting to include in the statement "what will make up strengths and weaknesses, opportunities and threats?"
3	ACCEPTS	NO COMMENT
4	ACCEPTS	"I suggest that, throughout the research, pay attention to the fact that many public policies are express manifestations of legislators and/or executors, not that they represent a real need for the population, or rather, perhaps even a need, but there are other more priority ones that have been left aside for the benefit of this developing population. So, I suggest you pay attention to this fact which, unfortunately, is not that rare"
5	ACCEPTS	"The risk of threats should be monitored and assessed throughout the execution of the programs"
6	ACCEPTS	NO COMMENT
7	ACCEPTS	NO COMMENT
8	PARTIALLY ACCEPTED	"Although there are opportunities within public policy, they are less relevant than in the private sector, since public policies should have a more universal character. Perhaps, the term opportunity and threats could be replaced by conditions, success and critical factors"
9	ACCEPTS	NO COMMENT
10	ACCEPTS	NO COMMENT

Source: prepared by the Authors.

Therefore, after the Evaluation of activity 3 of Stage 1, which is called Diagnosis Regarding the Implementation of the Public Policy in Question, of the ten experts who participated in the jury, nine accepted and one partially accepted. Three experts made comments, only reinforcing the acceptance of the proposed terms. Six experts chose not to make comments, which are shown in Table 5. The comment of expert 2 was accepted, as there is a basis in the literature. Expert comment 8 has been incorporated into the final text of the *framework*.

EVALUATION REGARDING ACTIVITY 4 OF STAGE 1: OBJECTIVES AND GOALS

Proposed Texto

"The objectives are important because they mean the reason for the existence of the plan and represent the results expected by the public agency that implements it. They should be clearly and concisely expressed and designed for the intended purpose, in order to take advantage of the opportunities and minimize the threats identified in the diagnosis.

In turn, the goal is a quantifiable and measurable expression of the objectives. Goals should be realistic and include a timeline with deadlines and assignments of responsibilities."

Table 6 – Evaluation of Activity 4 of Stage I

SPECIALIST	EVALUATION	COMMENTS
1	ACCEPTS	"I suggest scrutinizing the feasibility of the goals by the SMART criterion (Specific, Measurable, Attainable, Realistic, Time-Bound)"
2	ACCEPTS	NO COMMENT
3	ACCEPTS	NO COMMENT
4	ACCEPTS	"Great point, there is no initiative that works without proper monitoring and control. I also suggest that, in addition to metrics involving several dimensions, insert the Marketing ROI, it is a concept little observed in the public service"
5	ACCEPTS	NO COMMENT
6	ACCEPTS	NO COMMENT
7	ACCEPTS	NO COMMENT
8	ACCEPTS	NO COMMENT
9	ACCEPTS	NO COMMENT
10	ACCEPTS	NO COMMENT

Source: prepared by the Authors.

According to the evaluations of activity 4 of Stage 1, called Objectives and Goals, all ten experts accepted this activity. Eight experts did not comment and two brought their notes, as shown in Table 6. The comments pointed out were not included in the final model of the *framework*, because the comment of expert 1 refers to an approach that requires prior knowledge about the proposed model, which could make it difficult for the user to understand the *framework,* while the comment of expert 4 does not concern this activity.

EVALUATION REGARDING ACTIVITY 5 OF STAGE I: ELABORATION OF MARKETING STRATEGIES FOR EACH OF THE VARIABLES OF THE MARKETING MIX

Proposed Texto

"The Marketing Mix for Public Services is represented by the combination of the controllable Marketing variables, described below:

a) Product/Service/Benefit - Corresponds to what is offered by the Public Administration. Most of the time they are services such as urban cleaning. However, there may be products involved, as in this case, garbage bags to be used by the population. It will always be necessary to be clear about the benefits that will be offered to the population, through the products and/or services provided;

b) Monetary and non-monetary costs – This is what will be made available by the population in exchange for the services provided by the Public Administration. It is necessary to define whether there will be monetary values involved, as well as whether there are non-monetary costs, such as physical travel, waiting times for care,

documentation gathering, change of action (not smoking in certain places), behavior (quitting smoking), attitude (fighting smoking) or value (valuing health and well-being above material aspects);

c) Location of service delivery - These decisions refer to the location chosen to provide services, how citizens can access it and how they will be welcomed. The wide availability of service stations and ease of access are benefits that will neutralize travel times, queues and other discomforts, thus reducing the non-monetary costs to be imposed on citizens;

d) Communicational and Promotional Actions – Here the promotional actions to be used in the action and their corresponding media plan will be specified. Examples of these actions are: advertising, advertising, personal selling, public relations, and digital marketing. This choice should take into account the peculiarities of the action to be developed, that is, what, how and when to communicate and which media will be used;

e) People involved in the provision of services: this is the definition, choice and training of the people who will participate in the provision of services;

f) Processes for the provision of services: Refers to the methods and procedures that will ensure quality, as well as the homogeneity of the services provided;

g) Physical Evidence corresponds to the tangible attributes associated with the provision of services, for example: the uniform of the service provider, the equipment used, and where the interaction with citizens occurs, or any other tangible component employed".

Table 7 – Evaluation of Activity 5 of Stage I

SPECIALIST	EVALUATION	COMMENTS
1	ACCEPTS	NO COMMENT
2	ACCEPTS	NO COMMENT
3	ACCEPTS	NO COMMENT
4	ACCEPTS	"It's very clear"
5	ACCEPTS	NO COMMENT
6	ACCEPTS	NO COMMENT
7	ACCEPTS	NO COMMENT
8	PARTIALLY ACCEPTED	"I would add: relations with other jurisprudences of power and legal environment"
9	ACCEPTS	"Depending on the public policy of action, I understand that the variables will be evaluated and analyzed as to their relevance"
10	ACCEPTS	NO COMMENT

Source: prepared by the Authors.

After the evaluation by the experts of Activity 5 of Stage 1 (Elaboration of Marketing Strategies for each of the variables of the Marketing Mix), of the ten members of the jury, nine accepted, and of these, two inserted comments. One expert partially accepted and praised his comment according to Table 7. Expert 8 partially accepted the proposed text and his comment was

incorporated into the final text, due to pertinence. The comment of expert 9 presented a ratification of its acceptance and, therefore, was not incorporated.

EVALUATION OF ACTIVITY 6 OF STAGE I: PREPARATION OF ACTION PROGRAMS

Proposed Texto

"Each of the actions to be developed, those responsible, as well as the schedule and budget that will contribute to achieving the objective must be detailed. Evidently, the periodicity of these programs will tend to be defined in line with the instruments of government planning.

With regard to the budget, the cost necessary for the development of the activities inherent to the public service to be implemented is identified.

Budget is the space to record the provisioned budget and the costs involved in the activity. It should be noted that in public assistance activities, the variables that measure return in general will not be financial variables or immediate results. Many will involve behavioral changes and improvements, such as education, culture and quality of life."

Table 8 – Evaluation of Activity 6 of Stage I

SPECIALIST	EVALUATION	COMMENTS
1	ACCEPTS	NO COMMENT
2	ACCEPTS	NO COMMENT
3	ACCEPTS	"This observation could be part of the evaluation/measurement of results stage. It should be noted that in public assistance activities, the variables that measure return in general will not be financial variables or immediate results. Many will involve behavioral changes and improvements, such as education, culture and quality of life"
4	ACCEPTS	"I suggest inserting a Forecast, that is, a budget review. This is a common practice in any organization, especially in public ones, but it makes the final cost much higher than the approved budget. I warn you of the differences in concepts: Cost, Price, Value, Expense and Expense. Apart from the last two, where Expenditure encompasses Expenditure, the others are not synonymous and do not provide the same metrics"
5	ACCEPTS	NO COMMENT
6	ACCEPTS	NO COMMENT
7	ACCEPTS	NO COMMENT
8	ACCEPTS	NO COMMENT
9	ACCEPTS	NO COMMENT
10	ACCEPTS	NO COMMENT

Source: prepared by the Authors.

Therefore, after the evaluation of Activity 6 of Stage 1 called, Elaboration of Action Programs, all ten members of the expert jury unanimously accepted this Activity. Eight experts did not make any comments and two of them were able to present their suggestions, as corroborated in

Table 8. The comment proposed by expert 3 was accepted, but it was incorporated into Stage III, where this approach exists.

Once the evaluation of Stage 1 (Planning) is completed, the jury can evaluate Stages II and III proposed for the *framework*.

EVALUATION FOR STAGE II: IMPLEMENTATION

Proposed texto:

"In this stage, called Implementation, the transformation of what was planned will take place into effective actions that reflect the desired result. The plan will produce a document specifying who will do what, when, how, and at what cost. This turns the marketing strategy into action.

The plan must be shared with the internal groups of relevance of the Public Administration, that is, those impacted by the actions.

The plan provides a route for the public agent to easily assess or correct the path in a timely manner in the event of an emergency or non-compliance. The plan may have an annual or multi-annual horizon, according to the needs of the Administration".

Table 9 – Evaluation of Stage II

SPECIALIST	EVALUATION	COMMENTS
1	ACCEPTS	NO COMMENT
2	ACCEPTS	"Great"
3	ACCEPTS	NO COMMENT
4	ACCEPTS	"I suggest broadening the debate on the plan, to open it into Strategic, Tactical and Operational. The Strategic Plan cannot (and does not need) to be disclosed to everyone. Then, all the theory about Planning should be included in the evaluation"
5	ACCEPTS	NO COMMENT
6	ACCEPTS	NO COMMENT
7	ACCEPTS	NO COMMENT
8	ACCEPTS	NO COMMENT
9	ACCEPTS	NO COMMENT
10	ACCEPTS	NO COMMENT

Source: prepared by the Authors.

Again, unanimously, all experts accepted STEP II, called Implementation, proposed for the *framework,* and of the ten experts, eight chose not to present comments and two of them presented their contributions, as shown in Table 9. The comment listed by expert 4 was not incorporated into the *framework*, as it does not apply to the Public Administration, which is governed by the principle of Publicity of public acts.

EVALUATION REGARDING STAGE III: FORMS OF EVALUATION AND CONTROL

Proposed Texto

"The evaluation is the part of the plan in which the measurements that will be used to check the success of the planning effort transformed into actions will be highlighted, which should specify what, who, when, where, how and why.

The monitoring and evaluation of performance will have as a reference the goals defined in Activity 4 of Stage I.

Some items that may be included in the evaluation process are:

a) Production Measurements — will identify and quantify what has already been accomplished (such as the number of leaflets distributed, the number of cars inspected in urban blitzes, etc.);

b) Outcome Measurement — focuses on the citizen's response related to the actions being measured (number of people who have been immunized in the vaccination campaign for the elderly, number of students enrolled, etc.);

c) Impact Measurements — is the stage related to the benefits arising from the planned actions. As examples, we can mention the reduction in accidents resulting from the "If you drive, don't drink" campaign, the decrease in the number of teenage pregnancies, as a result of the awareness campaign".

Table 10 – Evaluation of Stage III

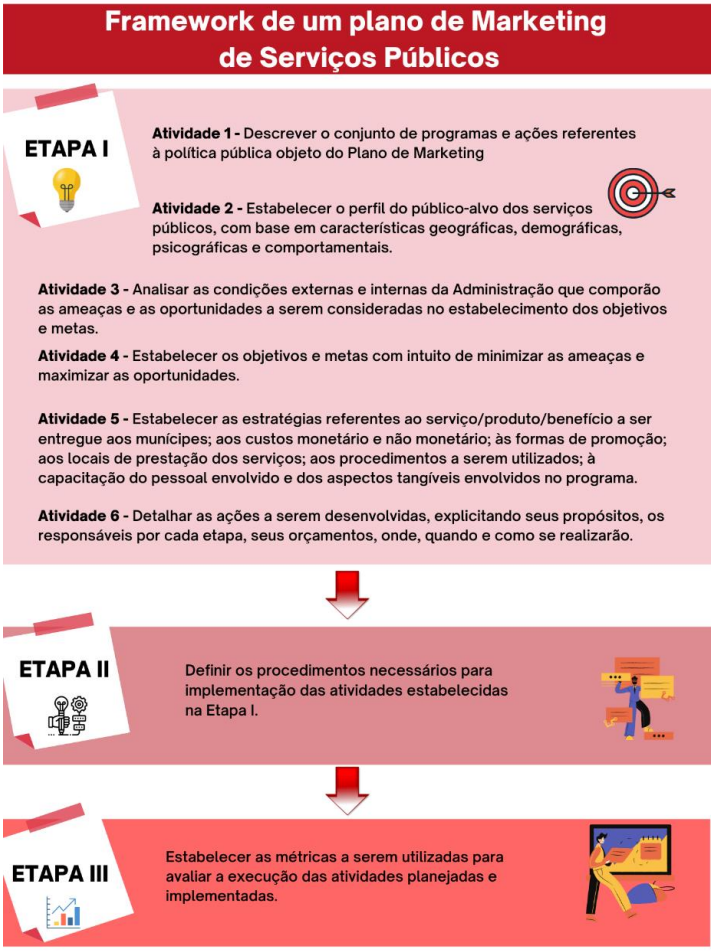
SPECIALIST	EVALUATION	COMMENTS
1	ACCEPTS	NO COMMENT
2	ACCEPTS	NO COMMENT
3	ACCEPTS	"With the insertion of the information already highlighted"
4	ACCEPTS	"I suggest emphasizing more the difference between Results and Impact, these are situations that, for an unsuspecting reader, can lead to the same conclusion"
5	ACCEPTS	"Carry out partial assessments, especially in relation to risks and threats"
6	PARTIALLY ACCEPTED	"At this moment, I believe it is the stage of presentation of the forms of evaluation so that it is possible to verify if the proposed actions met the objectives"
7	ACCEPTS	NO COMMENT
8	ACCEPTS	NO COMMENT
9	ACCEPTS	NO COMMENT
10	ACCEPTS	NO COMMENT

Source: prepared by the Authors.

Regarding STAGE III, called Forms of Evaluation and Control, nine experts accepted the proposed text, of which three made comments and six chose not to comment. It is noteworthy that specialist number six partially accepted and made his considerations and comments according to Table 10 and the comments are pertinent and are included in the final text.

Therefore, according to the objective proposed for this work, the *framework* adjusted for Public Services Marketing (Table 11) is presented below, after the opinions and comments of the experts, composed of a schematic representation and an operational description, detailing the stages of the process (Table 12):

Table 11 – Schematic Representation of the *Framework*



Source: prepared by the Authors.

Table 12 – Operational Description of the steps considered in the *framework*

STEP I – Planning
Activity 1 - Description of the Public Policy object of the Marketing Plan
The starting point for the elaboration of the Marketing plan is the specification of the action to be developed and the public policy to which it is linked. Example: a housing program that aims to provide conditions for a certain population to access their own housing.
Activity 2 – Definition of the Target Audience
The target audience will be defined by the set of characteristics, which clearly identify the profile of the people involved in the action, whether they are decision-makers, influencers or beneficiaries.
Therefore, it is necessary to segment the population with the purpose of identifying these target segments, understanding that a segment is the set of people with similar characteristics in relation to the public policy, which is the object of the proposed action. The target audience will correspond to one or more of these identified segments, which need to be quantifiable, significant and accessible.
The definition of these target segments has a direct impact on determining the audiences to be considered, enabling much more clarity on where, when, how and, above all, for whom to implement a Marketing Plan.
The variables that can be used in this segmentation process are the following:

a) demographic - used to divide this universe of people, according to population variables, such as age, sex and/or gender (when this differentiation is necessary), occupation, level of education, income, family size, race, generation, social class, nationality, place of birth and religion;
b) geographic - it makes it possible to divide the universe of people involved, directly or indirectly, according to the geographic regions to which they belong, such as: city, subdistrict, neighborhood, street, etc.;
c) psychographic - these variables allow the total set of people involved to be divided into segments, based on psychological/personality traits as well as lifestyles and values;
d) behavioral – it is considered the analysis of people's behavior and attitude about a service or subject that is intended to be addressed. Some examples of these variables are: form of adherence to the action proposal, occasion and rate of use, expected benefits, degree of adherence to the campaign proposals, among other possibilities of behavior in relation to the objective of the action being implemented.
Demographic and geographic variables will be present in most segmentation processes. However, behavioral and psychographic measures will be useful when a refinement in the definition of the target audience is justified.
At the end of the segmentation process, each Marketing action will have its target audience defined and chosen in accordance with its purposes, remembering that the more precise and focused a characterization of the target audience profile is, the better the conditions for planning and executing the steps that make up the Marketing plan.
It is necessary to keep in mind that the population is not a homogeneous whole, being composed of different groups of individuals, each with different expectations of benefits;

Activity 3 - Diagnosis regarding the implementation of the Public Policy in question

This diagnosis includes the identification of the threats and opportunities that present themselves in the face of the proposed action. To this end, an internal analysis must be carried out, identifying the strengths and weaknesses, as well as an external analysis containing the favorable and unfavorable situations to be faced.
From the joint analysis of these internal and external data, threats (negative aspects) and opportunities (positive aspects) can be identified, which will serve as a reference to establish the objectives and action programs to be implemented.
It is important to note that favorable situations and unfavorable situations are not automatic synonyms of opportunities and threats. Thus, in order to identify the presence of an opportunity or the existence of a threat, it is essential to confront the external favorable and unfavorable situations with the strengths and weaknesses of the Administration so that it can be concluded whether a threat or opportunity actually occurs;

Activity 4 - Objectives and Goals

The objectives are important because they signify the reason for the existence of the plan and represent the results expected by the public agency that implements it. They should be clearly and concisely expressed and designed for the intended purpose, in order to take advantage of the opportunities and minimize the threats identified in the diagnosis.
In turn, the goal is a quantifiable and measurable expression of the objectives. Goals should be realistic and include a timeline with deadlines and assignments of responsibilities.

Activity 5 - Elaboration of Marketing Strategies for each of the variables of the Marketing Mix

The Marketing Mix for Public Services is represented by the combination of the controllable Marketing variables, described below:
a) Product/Service/Benefit - Corresponds to what is offered by the Public Administration. Most of the time they will be services, such as urban cleaning. However, there may be products involved, as in this case, garbage bags to be used by the population. It will always be necessary to be clear about the benefits that will be offered to the population, through the products and/or services provided.
b) Monetary and Non-Monetary Costs – This is what will be made available by the population in exchange for the services provided by the Public Administration. It is necessary to define whether there will be monetary values involved, as well as whether there are non-monetary costs, such as physical travel, waiting times for care, documentation gathering, change of action (not smoking in certain places), behavior (quitting smoking), attitude (fighting smoking) or value (valuing health and well-being above material aspects).
c) Location of the Provision of Services - These decisions refer to the place chosen to provide the services, how citizens can access it and how they will be welcomed. The wide availability of service stations and ease of access are benefits that will neutralize travel times, queues and other discomforts, thus reducing the non-monetary costs to be imposed on citizens.
d) Communicational and Promotional Actions – Here the promotional actions to be used in the action and their corresponding media plan will be specified. Examples of these actions are: advertising, advertising, personal selling, public relations, and digital marketing. This choice should take into account the peculiarities of the action to be developed, that is, what, how and when to communicate and which media will be used.
e) People Involved in the Provision of Services: this is the definition, choice and training of the people who will participate in the provision of services,
f) Processes for the Provision of Services: Refers to the methods and procedures that will ensure quality, as well as the homogeneity of the services provided;

g) Physical Evidence corresponds to the tangible attributes associated with the provision of services, for example: the uniform of the service provider, the equipment used, and where the interaction with citizens takes place, or any other tangible component employed; **Activity 6 - Elaboration of Action Programmes** Each of the actions to be developed, those responsible, as well as the schedule and budget that will contribute to achieving the objective must be detailed. Evidently, the periodicity of these programs will tend to be defined in line with the instruments of government planning. With regard to the budget, the cost necessary for the development of the activities inherent to the public service to be implemented is identified. Budget is the space to record the provisioned budget and the costs involved in the activity. It should be noted that in public assistance activities, the variables that measure return in general will not be financial variables or immediate results. Many will involve behavioral changes and improvements, such as education, culture, and quality of life.
STEP II - Implementation At this stage, what was planned will be transformed into effective actions that reflect the desired result. The plan will produce a document specifying who will do what, when, how, and at what cost. This turns the marketing strategy into action. The plan must be shared with the internal groups of relevance of the Public Administration, that is, those impacted by the actions. The plan provides a route for the public agent to easily assess or correct the path in a timely manner in the event of an emergency or non-compliance. The plan may have an annual or multi-annual horizon, according to the needs of the Administration.
STAGE III – Forms of Evaluation and Control And finally, the last step, has the purpose of presenting the Forms of evaluation and control. The evaluation is the part of the plan in which the measurements that will be used to check the success of the planning effort transformed into actions will be highlighted, which should specify what, who, when, where, how and why. The monitoring and evaluation of performance will have as a reference the goals defined in Activity 4 of Stage I. Some items that may be included in the evaluation process are: a) Production Measurements - will identify and quantify what has already been accomplished (such as the number of leaflets distributed, the number of cars inspected in urban blitzes, etc.); b) Outcome Measurements - focus on the citizen's response related to the actions being measured (number of people who have been immunized in the vaccination campaign for the elderly, number of students enrolled, etc.); c) Impact Measurements - is the stage related to the benefits arising from the planned actions. As examples, we can mention the reduction in accidents resulting from the "If you drive, don't drink" campaign, the decrease in the number of teenage pregnancies, as a result of the awareness campaign.

Source: prepared by the Authors.

CONCLUSION

The results offered by the experts' answers were analyzed in the previous item, when we were able to verify a significant agreement with the composition of the *framework* submitted to the evaluation. It was observed that most of the comments presented endorsed the acceptance of the original text. Due to its relevance, four suggestions were incorporated into the composition of the *framework*, whose final version, already validated, had been previously presented.

The insertions made from the experts' comments are presented in the final *framework*.

Therefore, according to the objective proposed for this work, it was possible to present the *adjusted framework* for Public Services Marketing, after the opinions and comments of the experts, composed of a schematic representation and an operational description, detailing the steps of the process.

For Silva, Minciotti and Gil (2014), the application of Marketing in public institutions contributes to the good performance of the provision of services to taxpayers.

The Brazilian literature on Public Services Marketing is still scarce. The present study seeks to contribute to increase the Academy's involvement with the theme.

It is also expected that this research can present relevant material on the subject, as well as add to the studies already carried out, thus helping to better understand the facilities or difficulties that public managers may have in the applicability of Marketing in the public area.

Thus, there is a contribution to academia and the Public Administration sector about this unconventional application of Marketing, called Public Services Marketing, in the set of the theoretical framework and *framework* presented.

The impossibility of applying the *framework* in a real situation leaves a path to be followed by other studies, aiming to improve this contribution, presented here.

Of course, the issue is not over. The possibility of expanding this research may present improved adjustments.

It is recommended for future studies the practical application of the *developed framework* .

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Controllership in micro and small companies: A bibliometric study

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Geiza Gomes da Silva[1] and Tatiana Silva Fontoura de Barcellos Giacobbo[2]

ABSTRACT

Controllership presents itself as an instrument capable of assisting senior management in planning their strategies in the formation of competitive companies for the market. Thus, the present work aims to analyze the functions of the controllership area that can be implemented in Micro and Small Companies. To this end, the content analysis method was used, to map the existing literature on the subject, with journals published between 2011 and 2021, on the SPELL platform, in which predominant characteristics in the implementation of controllership in these small organizations were identified. The main result found was that in 70.59% of the publications the authors used field research to prepare the research, and with regard to the controllership tools used in Micro and Small Companies, the management of costs and cash flow appear as the most described in the researches explored.

Keywords: Controllership, Micro and Small Enterprises, Decision Making.

[1] Bachelor of Science in Accounting
State University of Maranhão (UEMA)
[2] Doctor in Economics
Federal University of Health Sciences of Porto Alegre

INTRODUCTION

The growth of micro and small enterprises (MSEs) has achieved a prominent role in the Brazilian economic scenario, since it represents 53.4% of the GDP in the trade sector and 36.3% in the service sector (SEBRAE, 2014). According to Sebrae (2019), which carried out a survey applied to MSEs, between May and August 2019, these companies face difficulties with the management of their capital and that about 52% of the participants (owners of micro and small companies) admitted to needing training in the area of financial control and management (SEBRAE, 2019).

Thus, controllership presents itself as an important sector for business management, as it plays the role of planning and outlining control techniques that make it possible to analyze the activities and generate the necessary information for the entity's decision-making in a timely manner (SANTOS; MACEDO, 2019). Professionals in this area are responsible for filtering what really matters for a strategy aligned with organizational objectives in order to ensure the continuity of the company.

Beuren and Miller (2010, p. 60) highlight that controllership can either be a department implanted in the organizational structure, or it can only be implemented its activities. In the latter case, as an extension of accounting and management support, with emphasis on internal controls and information supply.

By considering only the option of implementing activities and not necessarily a sector, an excellent tool can be found for micro and small companies that seek to develop and better organize their processes, considering that it can be very costly to create a specific sector to carry out such activities, and some of them still have a lean structure.

In this context, Joaquim and Macêdo (2020, p. 11) point to the possibility of having an external controllership, with a fixed-term contract, which provides a lower cost for the interested entity. Thus, regardless of specific characteristics, it is perfectly possible to adapt controllership to the size and needs of each company (FERNANDES; GALVÃO, 2016).

The aforementioned authors also mention that the lack of planning, organization and financial-patrimonial control are verified in most MSEs - pointed out as causes of *death* in many of them (SEBRAE, 2014). Thus, the need for professionals within these companies capable of performing the functions of *controller* (FERNANDES; GALVÃO, 2016).

In view of the highlighted need to control the strategic, economic and financial activities of MSEs and the quality of the information that controllership can bring to decision-making processes, this article seeks to answer the following question: which functions of controllership are preponderantly pointed out by studies published in Brazil as applicable to small and micro enterprises?

In order to solve the proposed problem, the general objective of analyzing the functions of the controllership area that are pointed out by the Brazilian accounting literature as applicable in small and micro companies is presented. Regarding the specific objectives, the following are presented: (i) to review the controllership literature and its application to small and micro enterprises; (ii) demonstrate the importance of controllership for small businesses; and (iii) to highlight the forms of implementation of the control area in micro and small companies.

The study is justified by its contribution to the expansion of studies on the subject in the academic area, because with regard to the research carried out in the area of control, they are more focused on large companies, to the detriment of such techniques of high management in small enterprises, in studies by renowned authors in the area such as Beuren and Miller (2010), Schmidt, Martins and Santos (2014) and Manzatti (2015). At the organizational level, its importance can be evaluated by the need to use controllership mechanisms that help managers of micro and small companies in their strategies and decision-making.

The article is structured in 5 sections, the first of which is this introduction. The second section brings the theoretical review, where the concept and potentiality of the control sector in MSEs is addressed, as well as the panorama of these companies in Brazil. In the third section, there is the methodology, here it is reported how the research was developed. In the fourth section, the discussion is made, in which the results obtained with the studies of other authors are compared with the results obtained. Finally, the conclusions are presented.

THEORETICAL REVIEW

CONTROLLERSHIP AND ITS POTENTIALITIES

Initially, the control area had its attributions and concepts based on accounting, aimed at the use of resources efficiently and effectively, to achieve business objectives (TAMBOSI, 2021). Subsequently, controllership became an internal sector of organizations, responsible for consolidating the information that revolves around the company's activities, supporting managers in decision-making (FERNANDES; GALVÃO, 2016).

Tambosi et. al (2021, p. 04) in a more contemporary view, define controllership as the area that acts to ensure the effectiveness of internal and external management processes, so that all those involved have access to the information necessary for the execution of their work. Oliveira, Perez Júnior and Silva (2011, p.5) also attribute to this department the responsibility for the design, preparation, implementation and maintenance of the integrated system of operational, financial and accounting information.

The person responsible for the controllership sector is called *controller*. Francisco et al. (2013, p. 69) point out that although the *controller* coordinates an information system that contains

management data, this does not replace the figure of the manager, who will continue to have the power of decision-making.

Still on the figure of this professional, for Oliveira (2015), due to its multifunctionality, the individual must have knowledge in the field of accounting and finance, information management systems, information technologies, legal aspects of business and business vision, quantitative methods, computerized processes for the production of goods and services. Thus, the *controller* must have diverse skills and vast knowledge, so that he can move through different areas.

Although different concepts are presented, it can be noted that in these definitions, there are aspects that lead controllership in the same direction, which is to seek to gather information that is in fact relevant to those who need to decide how to follow the organization, and the fact that it is directly linked to the management process. Controllership has an important function in companies, to support managers for the strategic management of the future (BEUREN; STHOFF; STEDILE, 2010).

Going a little deeper into the framing of this sector in an organization, Borinele (2009) attributes to it the purpose of management (management process), exercise of control, definition of goals, meeting the needs of managers, economic management and the modeling of information systems. It classifies it under three aspects: conceptual, procedural and organizational.

The controllership develops several functions according to the needs of the company and its size, and can act in production, finance, accounting, among others (SANTOS; MACEDO, 2019). Such functions validate the importance and adequacy of controllership to any branch and size of companies.

According to Fernandes and Galvão (2016, p. 04), controllership is well accepted in medium and, especially, large companies. The aforementioned authors attribute the lack of more specific studies in the area of controllership, which demonstrate its importance as a management tool, to its resistance in micro and small companies.

THE IMPORTANCE OF CONTROLLERSHIP TOOLS FOR MICRO AND SMALL BUSINESSES

Based on the fierce fight for a space in the competitive market and the desire of companies to remain firm, Monteiro and Barbosa (2011, p. 40) emphasize that the survival of companies depends more and more on a subsidized management of efficient and accurate management information for good performance. This concise information results in a more rational decision-making process, providing the maximization of profitability and profitability of the business.

Decision-making processes, according to Barbosa and Monteiro (2011), define which paths direct companies to achieve their objectives. Thus, information becomes necessary for managers to conduct their companies in the environment where they are inserted.

In this sense, controllership presents itself as an instrument, capable of assisting senior management in planning their strategies to become competitive in the market. This is focused on information management for internal users, as it is a monitoring department of a company, responsible for bringing efficiency to management (CASAGRANDE; PACHECO; PANOSSO, 2017).

Santos and Miranda (2016), in their research whose objective was to show the importance of controllership in micro and small companies, found that the constant improvement of management in MSEs is essential for survival in the business environment. They attributed to controllership an important role in this process, where the steps followed in the decision making of managers are identified and analyzed, which is useful for any company, whether small or large.

Barbosa and Monteiro (2011) believe that the application of controllership concepts in small companies would reduce the mortality of these companies, because by gathering timely information, the company can stay ahead of the adversities that may arise in the market. And so, use internal control as a tool to strategize and achieve goals.

According to Ferronato (2015), as the owner partners in the smallest companies have a direct connection with the departments, the owners themselves can elaborate the control, together with the accountant's consultancies who will present information and suggest ways to follow to meet the business needs. In this way, this internal command is done in a simple way, and even so, it contemplates the institution's objectives, with regard to the organization and control of activities.

Although well accepted in medium and large companies, controllership as a management tool encounters resistance among MSEs, due to the need for technical knowledge and personal skills in the administrative area (FERNANDES; GALVÃO, 2016). This is because, in some cases, this lack of skill comes from the manager himself, who in small companies, tends to be the owner, and these, in turn, do not pay attention to differentiating costs from expenses, profitability, liquidity, among other points, ignoring the principle of the entity.

Still on the perspective of acceptance of information control in small companies, the authors, cited above, defend the use of controllership elements in MSEs, starting from the point that the smaller the company, the smaller its transactions will be and the less the work of the person responsible for consolidating this information (FERNANDES; GALVÃO, 2016).

OVERVIEW OF MICRO AND SMALL ENTERPRISES IN BRAZIL

Micro and Small companies have a specific legislation, Law No. 123/2006, which classifies them according to their revenue and number of employees. Micro-enterprises are classified with annual revenues of up to R$ 360 thousand, employing up to 9 employees in the branches of commerce and services, and up to 19 employees in the industrial sector. While small companies are those that have a turnover of R$ 4.8 million per year, with a staff of 10 to 49 people in the trade and services sector or from 20 to 99 in industry (BRASIL, 2006).

Still on the General Law of MSEs, it gives them a different treatment, as to the form of collection and other points that end up favoring them. MSEs, therefore, have a more simplified form of tax collection, easier access to credits and the market, and also flexibility in the fulfillment of labor and social security obligations (BRASIL, 2006).

Although the individual impact caused by a Micro and Small Enterprise (MSE) is at first glance small, the collective effect caused by smaller enterprises is indispensable for most regions (SARANGO-LALANGUI; SAINTS; HORMIGA, 2018). Recent research highlights the important representativeness of Micro and Small Enterprises in the Brazilian economy, where they are responsible for 30% of the country's Gross Domestic Product (GDP) and make up 99% of Brazilian businesses (MINISTRY OF ECONOMY, 2020).

Thus, Lunardi and Dolci et. al (2017) point out that small enterprises can help a country achieve and sustain its socioeconomic development, with the generation of jobs and income distribution. And yet, in more developed countries, they can help in the production of patents and job creation for professionals who work with high technology.

In 2020, despite the pandemic situation experienced, which increased business mortality rates, especially in the field of small businesses, 626,883 micro and small companies were opened across the country. Of this total, 85% were micro-enterprises and 15% were small-sized enterprises (SEBRAE, 2020). This fact is due to the growth in entrepreneurship, which is increasingly present in the country.

In a broader context, MSE mortality scholars (MAHAMID, 2012; ROPEGA, 2011; SANTINI et al., 2015), point out three elements that are extremely important for the survival of these companies in the market, they are: the knowledge of management in administrative processes related to the market and customers; the conduct of financial management; and external elements (crises, interest rates, the pandemic itself, among others) (ANAGUSKO; ARAKI; MOSER, 2020). According to the aforementioned authors, these factors can be better worked on if there is a predisposition to implement controllership processes, because, "while the first two elements are obviously related to control, it can also be argued that a company that performs good controllership practices will be more likely to react more effectively and quickly to external shocks."

(ANAGUSKO; ARAKI; MOSER, 2020, p. 64). These are the points that highlight controllership in the strategic planning of organizations.

METHODOLOGY

In order to carry out and better develop a research, it is necessary to use methods that will bring specific characteristics to the article and thus make it possible to classify it. Thus, the present work is classified, according to Beuren (2014), in terms of its objective, procedure and approach, respectively, as exploratory, bibliometric and mixed (qualitative-quantitative).

Raupp and Beuren (2014, p. 80) characterize that exploratory research occurs when one has little knowledge of the theme and seeks to know the subject in greater depth in order to make it clearer or build important questions for the conduct of the work. Therefore, it was intended here to explore works that address the theme, with the aim of answering the proposed problem and filling gaps left by scholars.

In order to carry out the present research, the bibliometric method was used. Araújo (2006) points out that bibliometrics allows the identification and description of a series of patterns within scientific production. This technique helps to identify predominant characteristics about the theme studied (VASCONCELOS, 2014).

Bibliometrics in its systemic procedures for research elaboration has laws that lead it to its objectives. Among the main ones, Lotka's Law (1926) stands out, with emphasis on the authors and the number of articles produced by them. Bradford's Law (1926), with its focus on periodicals, has its premises in the number of periodicals produced within the subject addressed. And finally, Zipf's Law (1949), focusing on words, indicating the frequency in which they are used and thus attributing weight and importance to them. (MINEIRO and MAZZER, 2020)

As for the form of analysis, it is a mixed study, which uses both quantitative and qualitative methods. For Godoy (1995), qualitative research is not presented as a rigidly structured proposal, as it allows imagination and creativity to lead researchers to propose works that explore new approaches. Richardson (1999) points out that the quantitative approach is characterized by employing quantification, both in the modalities of information collection and in the treatment of data, through statistical procedures.

By gathering as much information as possible, through books, articles, theses and dissertations, this research uses content analysis, filtering central ideas of the authors, about the use and implementation of controllership in Micro and Small Companies. Thus, from these researches, the most effective ways of implementing this sector of accounting and its techniques applicable to MSEs are presented.

The Scientific Periodicals Electronic Library *(SPELL) platform was used as a source of research* , as it is a database that gathers and makes available free of charge scientific production, particularly in the areas of Public and Business Administration, Accounting and Tourism. As descriptors of the researches, the following terms were used: "controllership in micro and small companies", "difficulties of micro and small companies in the market", "*controller* profile", "controllership today", "implementation of controllership in MSEs." The period covered by the survey was from 2011 to 2021.

The research consisted of exploring the literature found, through the search on the scientific platform SPELL. Subsequently, the information was filtered according to the objective of the study. Soon after the survey and filter of the works, it is analyzed which techniques in the area of controllership are used in Micro and Small Enterprises, according to the literature, considering the results found by the authors in their publications.

To demonstrate the results obtained, the techniques that most appear in the articles are listed, indicating the incidence with which they appeared in the studies, and their objectives and effectiveness are described. By comparing the results, it is verified which elements are most used in the companies surveyed.

RESULTS AND DISCUSSIONS

With the adopted methodology, a database was obtained with 29 articles, published in national journals between 2011 and 2021, available on the SPELL platform, and of this total, 12 were discarded because they did not fit the theme. Thus, a total of 17 articles were reviewed, which are listed in the table below:

Chart 01 - Revised Articles

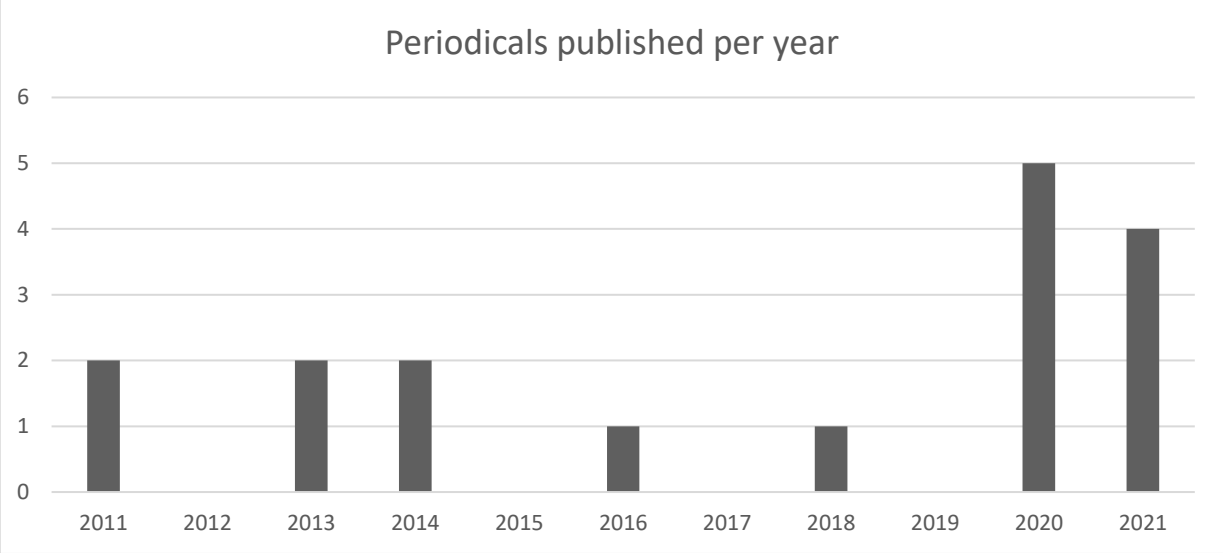
Author/Year of publication	Year of publication	Title	Newspaper
MONTEIRO and BARBOSA	2011	Business Controllership: Economic Management for Micro and Small Enterprises	Micro and Small Business Magazine (RMPE).
SANT'ANNA, LONGO, BARONE, COVA and OLIVEIRA	2011	Information technology as a tool for economic and financial analysis in support of decision making for micro and small companies.	Journal of Public Administration (RAP).
BEUREN, BARP e FILIPIN	2013	Barriers and possibilities of managerial accounting in micro and small companies through accounting services companies.	Context Magazine.
MOREIRA, ENCARNAÇÃO, BISPO, ANGOTTI and COLAUTO	2013	The importance of accounting information in the decision-making process in micro and small companies.	Contemporary Journal of Accounting (RCC)
CAMPOS and GÁUDIO	2014	The use of management control tools in micro and small companies in the metropolitan region of Rio de Janeiro	Micro and Small Business Magazine (RMPE).
HEINEN AND SOUTES	2014	Accounting information and cash management: a survey on its use by micro and small industries in Marechal Cândido Rondon (PR)	Minas Gerais Accounting Journal
FERNANDES and GALVÃO	2016	Controllership as a management tool in micro and small companies: a feasibility study and cost-benefit ratio.	Journal of Applied Technology (RTA).
AMORIM, OLIVEIRA, MANZI and BEMFICA	2018	Profile and competencies of the *controller* in companies in Recife.	Regional Accounting Council of Minas Gerais.
ANAGUSKO, ARAKI e MOSU	2020	Implementation of controllership in Micro and Small companies in Brazil: what to consider?	Micro and Small Business Magazine (RMPE).
CARRAZZONI, CARVALHO, CARRAZZONI and LEAL	2020	Organizational Innovation: Improvement in the management of micro and small business processes.	Brazilian Journal of Management and Innovation.
WRONG E HABERKAMP	2020	Analysis of the level of importance and intervening variables in the use of management tools in micro and small companies.	Micro and Small Business Magazine (RMPE).
MOURA, AFONSO, BLADES & BLADES	2020	Cost planning: A case study in the provision of electrical services in Hortolândia SP.	Micro and Small Business Magazine (RMPE).
SOUZA, WANDERLEY e HORTON	2020	Profile of *Controllers*: autonomy and involvement of controllership professionals.	Advances in Scientific and Applied Accounting (ASAA Journal)
FERREIRA, LEAL, FERREIRA & FERREIRA	2021	Profile of the *controller* and his strategic choices: an analysis of *Brazilian and Portuguese* controllers	Journal of Accounting and Organizations
PEREIRA and FAIA	2021	Internal control: a proposal for an improvement intervention for a small clothing company.	Management & Technology Magazine
REGINATO and DURSO	2021	Behavioral profile of *controllers* in Brazil: how are our professionals doing	Journal of Administration, Accounting and Economics (RACE)
TAMBOSI, JUNIOR, KROENKE'S HEIN	2021	Dimensions of the importance of controllership in organizations: a multivariate and multicriteria study.	Contemporary Journal of Accounting (RCC)

Source: Prepared by the authors (2022).

It can be seen from the table above that most of the publications in the eleven-year period, from 2011 to 2021, were published by the Micro and Small Business Journal (RMPE) – 5 articles. It is also verified, by the titles described, that the theme is directly linked to the managerial management of companies, as well as suggesting an openness of MSEs to innovative actions together with this management.

In this perspective, the figure below was elaborated, which shows the number of journals published per year:

Figure 01: Articles on controllership in SMEs by year of publication



It was found that the year 2020 was the year in which there were more publications of works that focused on the study of controllership in MSEs. And, although there were periods, between 2011 and 2021, that did not have any article published on the SPELL platform (2012/2015), in the last two years analyzed (2020-2021) there was an increase in interest in the topic.

Regarding the number of authors per article, it was noticed that they vary between two and five, as shown in table 01 below:

Table 01 – Number of authors per article

Distribution of Authors by Article	Number of Articles	Percentage
Two authors	07	41,18%
Three authors	03	17,65%
Four authors	05	29,41%
Five authors	02	11,76%
Total	**17**	**100%**

Source: Prepared by the authors (2022)

It should be noted that the collection of articles assembled is mostly written by two authors, which represents 41.18% of the research, followed by articles by four authors, with 23.53%. On the

other hand, only one article was written by an author, which in percentage makes up 5.88% of the filter.

When the procedures used in the elaboration of the research were verified, field research was pointed out as the predominant procedure, with a little more than 70% of the researches, as shown below:

Table 02 - Classification according to the procedures for the preparation of the articles

Kind	Quantity	Percentage
Bibliographic	04	23,53%
Case Study	01	5,88%
Field research	12	70,59%
TOTAL	**17**	**100%**

Source: Prepared by the authors (2022).

Within these field researches and case studies, micro and small companies from different places and segments, such as the clothing industry, industries, electrical service providers. It is noteworthy that all articles focused on the control area, as well as on the professionals who work in the area.

MAIN CONTROL TOOLS USED IN MICRO AND SMALL COMPANIES

It was sought to identify within the work, tools linked to the controllership sector, used by MSEs in their internal processes, to support management. Thus, the following points were found, as illustrated in the table below:

Chart 02 – Control functions found in MSEs

Authors	**Identified Roles**	**Descriptions**
MONTEIRO and BARBOSA (2011) |	Strategic Planning, Cost Control Management and Accounting Support.	Existence of an organization plan with adequate distribution of responsibility; cash flow control; cost apportionment; product pricing; figure of the accountant as a *controller*.
SANT'ANNA, LONGO, BARONE, COVA and OLIVEIRA (2011)	Economic and financial management, balance sheet analysis.	The use of software that can gather as much information as possible and at the same time synthesize this information into reports.
BEUREN, BARP e FILIPIN (2013)	Information generated by accounting.	Companies providing accounting services are seen as a way to manage and control processes, as well as to make decisions.
MOREIRA, ENCARNAÇÃO, BISPO, ANGOTTI and COLAUTO (2013)	Cash flow, inventory control, Balance Sheet and P&L.	It is present in the figure of the accountant, being the same as the one who provides this type of information to the company's manager.
CAMPOS and GÁUDIO (2014)	Control of accounts payable and receivable, cost management, pricing, profitability indicators, competitive pricing	Considering that cost management is a little more than the simple global monitoring of expenses, the research emphasized that cost management should include analyses of historical

		expenses, market references, and expenses versus use or result.
HEINEN AND SOUTES (2014)	Cash flow management	It was found that the most used information is: cash control, monitoring of accounts receivable, control of accounts payable, consultation of the purchasing area with the financial area, analysis of resources to be invested in salaries, and analysis of liquidity and cash position to plan the volume and the appropriate way in the distribution of profits
FERNANDES and GALVÃO (2016)	Cash flow management, Integrated Information System of operational, financial and accounting information.	In the person of a *controller* or the accountant himself, gather skills to plan, control, filter accounting and financial information capable of assisting management with budgets and costs.
AMORIM, OLIVEIRA, MANZI and BEMFICA (2018)	Preparation of financial and accounting reports, budget analysis, cost control.	Controllership acts as a sector of strong support to management, which requires technical, social and business skills.
ANAGUSKO, ARAKI e MOSU (2020)	Information system, pricing, business budget, matrix control of costs and fixed expenses, cash flow projection, fundraising, performance analysis.	Controllership must go beyond monitoring financial and accounting results, coordinating the preparation of strategic and operational planning, ensuring the organization's good performance.
CARRAZZONI, CARVALHO, CARRAZZONI and LEAL (2020)	Information System for management control, manuals for operationalization of tasks.	Visualize processes as a system, detect errors and gaps, suggest improvements, and standardize organizational actions
ERROR E HABERKAMP (2020)	Control of accounts payable and receivable and sales, monitoring of inventory, costs, bank and cash balances, contribution margin, monitoring of accounting, financial and economic break-even points.	These are both operational and managerial tools, which serve as an aid for price formation, proper functioning of cash flow, budgeting, etc...
MOURA, AFONSO, BLADES & BLADES (2020)	Planning and cost analysis.	The control is given by the planning of costs, in this study, in a service provider company. This planning contributes to the pricing of the activities offered, as well as to the apportionment and projection of costs.
SOUZA, WANDERLEY e HORTON (2020)	Fiscal monitoring, cost management, bookkeeping, financial and non-financial indicators.	The size of the organization would play a significant role in the controller's involvement with the business and his autonomy within the organization.
FERREIRA, LEAL, FERREIRA & FERREIRA (2021)	*Bean conter* e *business partner*	The *controller*, gradually, has been oriented more towards the formulation and implementation of strategies as a business partner, contrary to the traditional view regarding his role of assisting in the decision-making of managers.
PEREIRA and FAIA (2021)	Evaluation of the production process, inventory control, price management.	Systematization of internal control of information, whose objective is to present and apply improvement solutions to problems related to security, reliability, timeliness and integrity of information in the production environment.
REGINATO and DURSO (2021)	Comprehensive financial, tax and asset control.	Involvement in the company's decision-making processes according to operational interdependence, competence

		of line managers and formalization of planning and budgeting
TAMBOSI, JUNIOR, KROENKE'S HEIN (2021)	Calculate, check, record and collect taxes; financial statements; patrimonial control.	It assigns to the controllership the role of advisory, consultant, auditor and spokesperson for senior management.

Source: Prepared by the authors (2022).

It is perceived that within Micro and Small Enterprises many of the accounting activities are considered to be for their internal control, and also, the figure of the accountant is seen as a kind of "*controller"* in these units. However, some of the functions pointed out by the authors are actually the responsibility of this professional, such as: the formulation and analysis of balance sheets, income statement, bookkeeping, among others.

Furthermore, it is noted that information systems appear as subterfuges that contribute to the controllership area. With this instrument, the institution can gather in a synthesized and organized way managerial information of a financial, economic and accounting nature, which will assist in decision-making (*bean contain*). Furthermore, to make controllership not only as the sector that gathers data, but also as the one that actively participates in the formulation and execution of strategies (*business partner*). The way this sector or the person responsible for the controllership task operates depends a lot on the size of the company, which in the case of MSEs is usually linked to the figure of the accountant.

In addition, cash flow management is one of the elements that most appears in the analyzed studies, as applicable to small companies. Given that it is something very simple, easy to execute, which is linked to daily activities, controlling inputs and outputs, in order to visualize accounts payable and receivable. Its application, in the short term, is useful to know where the realizations were applied and in the long term, it serves to measure whether the company will be able to meet future obligations.

Thus, cost control management is the most cited by studies as an important element for the formulation of the price of a product or service. Thus, it is possible to perceive the expenses that permeate the company's core activity (inputs, taxes, salaries, among others.), which is of paramount importance for the analysis of losses and profits arising from this activity.

Last but not least, another control function performed by controllership, which can also be easily introduced in an MSE, is inventory control. Through it, managers can visualize customer demand in relation to their supply and thus buy more assertively, improve their production and reduce losses.

CONCLUSION

The research proposed to present attributions of controllership, which in the light of scholars in the area, are applicable to Micro and Small Companies. Considering that this term and the activities that surround it are more preponderant in large institutions, the general objective of the work was to analyze the functions of the controllership area that are pointed out by the Brazilian accounting literature as applicable in small and micro enterprises.

It was then observed that the surveys brought simple functions, which will not necessarily require the presence of a *controller* in the company, (person responsible for the controllership sector). It is noteworthy that some authors studied state that controllership activities can be performed by the accountants themselves. After all, some of the tools presented are already his responsibility, which also dispenses with the creation of a sector only for control, which in the case of small companies, which are the focus of this study, can be a favorable point.

With the analysis of a total of 17 articles published between 2011 and 2021, it was noted that in this period, the year 2020 was the period in which the highest number of publications was presented, with the theme of controllership in MSEs, which were 5 articles. It was also observed that in 70.59% of the studies analyzed, a field research was used as a methodological tool.

As for the functions found, it was found that cost control and cash flow management were the most pertinent among the authors. Both go hand in hand in the day-to-day life of a company. In this way, when these tools are well managed, various information can be extracted that contributes to management decision-making.

Therefore, it was found that an information management system is essential for the effectiveness of control management in any company, because it creates a database that gathers data that contemplates the company as a whole. It was observed, however, that such systems are not yet present in many MSEs, which still carry out their controls through outsourced accountants.

It should be noted that the main limitations of this study were: the selection of journals, through the SPEEL platform, that matched the theme, based on the term "controllership in micro and small companies", since the production of articles with the proposed theme is small. This does not take away the relevance of this research, as it favors the discussion on the subject and can foster new research in the area.

For future research, a deeper study of the use of these tools in Micro and Small Enterprises is suggested. In addition, there is room to analyze the impact that the use of these tools causes within these institutions.

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Challenges of providing homemade diets for dogs and cats, with a focus on BARF and prey model modalities

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Angélica Kischener de Moura[1], Vivian Pedrinelli[2], Cynthia Pieri Zeferino[3], Vando Edésio Soares[4], Liandra Maria Abaker Bertipaglia[5] and Käthery Brennecke[6]

ABSTRACT

The change in the consumer profile of pet owners and the increase in concern about ingredients present in industrialized complete foods has made more and more owners choose to offer homemade diets. However, many tutors seek recommendations found on websites, offering their animals diets that mostly do not meet their nutritional needs and can pose health risks. Among the modalities of homemade diets, raw meats have been gaining more and more followers in Brazil, with emphasis on the BARF (biologically apropriate raw food) categories, which includes raw meats with and without bones, viscera and a small portion of vegetables, fruits and seeds, and prey model, which does not require the inclusion of any foods of plant origin, allowing only the inclusion of meats with and without bones and offal, in order to mimic the natural diet of wolves. This chapter addresses the benefits vs. negative points regarding the provision of homemade diets for dogs and cats, in addition to the nutritional requirements, with emphasis on calcium and phosphorus, considered the main macrominerals. In short, the objective is to alert dog and cat owners about the importance and responsibility in relation to the provision of balanced homemade diets, thus emphasizing the need for formulation by a trained professional, with technical-scientific support, in order to provide satisfactory diets for the development, well-being and longevity of dogs and cats.

Keywords: Nutritional deficiency, Raw diets, Macrominerals, Pets, Feed formulation websites.

[1] MSc. Universidade Brasil, UB, Descalvado-SP
[2] Doctor MVZ-USP, Pirassununga-SP campus
Nutricarevet, São Paulo-SP
[3] Doctor FMVZ-UNESP, Botucatu campus-SP
Full Professor at Universidade Brasil, UB, Descalvado-SP
[4] Doctor FCAV-UNESP, Jaboticabal-SP campus
Full Professor at Universidade Brasil, UB, Descalvado-SP
[5] Doctor FCAV-UNESP, Jaboticabal campus-SP
Full Professor at Universidade Brasil, UB, Descalvado-SP
[6] Doctor FZEA-USP, Pirassununga campus-SP
Full Professor at Universidade Brasil, UB, Descalvado-SP

INTRODUCTION

In 2022, the three largest countries in canine population were the USA (69.9 million), China (27.4 million) and Russia (12.5 million), and in relation to the feline population the top four countries were the USA (74.1 million), China (53.1 million), Russia (17.8 million) and Brazil (12.5 million), according to Elad, (2024).

In recent years, several arguments have been made to support the use of natural food for dogs and cats. Increased concerns about the use of additives and preservatives in commercial *pet* foods have led to the desire of some pet owners to avoid industrially prepared foods (COUTO & CORTE REAL, 2019).

In response to the constant recall of commercial pet products, differentiated products with the appeal of "natural" began to appear on the market (COUTO & CORTE REAL, 2019).

The *Association of American Feed Control Officials* (AAFCO, 2016) defines "natural" as a food or ingredient derived exclusively from unprocessed plant, animal, or mineral sources, or has undergone physical processing, heat processing, purification, extraction, hydrolysis, enzymolysis, or fermentation, but has not been produced by a chemically synthetic process and does not contain any additives, or processing aids that are chemically synthetic, except in quantities that may inevitably occur in manufacturing practices.

The *European Pet Food Industry Federation* (FEDIAF, 2021) supports a stricter definition of "natural", proposed by Groot & Shreuder (2009):

> ... components of pet food without any additives and that have only undergone processing to make them suitable for pet *food* production and the maintenance of the content of all essential nutrients. Examples of processing include: freezing, concentration and pasteurization.

Raw diets emerged as one of the options to meet this demand from owners to feed their animals something as close as possible to their ancestors, the wolves, which they consumed or consume in the wild.

Among these diets, two of the most well-known and practiced modalities are BARF (acronym for *Biologically Appropriate Raw Food Diet*) and *prey model*. The BARF modality is an alternative raw diet designed to provide dogs with boneless meats, cuts containing bones and meats, a small portion of vegetables, fruits, and seeds. The *prey model* , on the other hand, aims to provide dogs with a diet that mimics what their ancestors consumed. In this modality, the ingredients are based on whole prey and do not include plant ingredients (PERFECTLY RAWSOME, 2023).

The Brazilian Association of the Pet Products Industry (ABINPET, 2023), recognizes that there are benefits to using homemade diets. The main one is high bioavailability, that is, a greater amount of nutrients can be absorbed and used by the animal's body and because of this greater

absorption, the volume of feces is reduced. However, people's lifestyles must be considered. Currently, feeding needs to be practical, as few tutors really have the time and attention that the natural diet requires.

Despite recognizing the best bioavailability, ABINPET (2023) takes a stand against the practice of feeding pets with homemade food. If it is not correctly handled and does not contain an adequate nutritional balance, it harms the mental and physical development of pets and can cause various diseases. This is because homemade food may not be precisely balanced to contain essential nutrients in the minimum recommended amounts for pets.

Given the growing interest in raw homemade dog food, it is important to investigate the potential risks associated with providing this type of food. Currently, there are no studies available in the literature that provide information on the levels of minerals, especially calcium and phosphorus, as well as the relationship between these minerals, in raw homemade diets containing bones.

In view of the above, the urgency of a more detailed composition of raw homemade diets with bones, both those prepared domestically and those produced commercially, becomes evident. This approach aims to expand the understanding of this type of food, improving not only the nutritional approach, but also the knowledge of tutors in relation to this food modality for pets.

A complete and balanced diet is essential for the health and well-being of dogs and cats. The right diets for each stage of life of these animals provide the necessary nutrients for reproduction, growth and for a long, healthy and active adult life. These also prevent eating-related disorders, which can occur due to nutritional deficiencies or excesses (FEDIAF, 2021).

There are three important bodies internationally recognized for researching and publishing the nutritional profiles of foods designated for growth, reproduction and maintenance of dogs and cats (MANUAL PET FOOD BRASIL, 2019):

- *The National Research Council* (NRC), of the American National Academy of Sciences, is the leading provider of nutritional recommendations for dogs and cats;
- *The Association of American Feed Control Officials* (AAFCO) is a trade body that aims to regulate the quality and safety of feed ingredients and foods in the United States;
- *The European Pet Food Industry Federation* (FEDIAF), represents the national associations of the pet food industry in Europe.

FEDIAF (2021) reports that balanced nutrition, which ensures adequate consumption of energy, proteins, minerals, and vitamins, is essential to ensure the health and longevity of dogs and cats. In 2011, the *World Small Animal Veterinary Association* (WSAVA) published global nutrition guidelines, in which it considered nutritional assessment as the 5th vital parameter, followed by temperature, pulse, respiration and pain assessment. Together with the *Global Nutrition Committee*, they have developed tools that increase the efficiency of nutritional assessment and

recommendations, such as dietary history sheets, feeding guides for hospitalized patients, body condition classification sheets, and caloric intake recommendations for dogs and cats (WSAVA, 2023).

The nutritional needs of dogs and cats are the subject of ongoing research. Estimates of nutritional levels should be decided based on technical knowledge of the concepts and methodologies that govern the area of nutrition. It is very important to consider that incorrect definitions of nutritional requirements can cause serious harm to pets, especially to their health, well-being, and longevity (COUTO & CORTE REAL, 2019).

INDUSTRIALIZED FOODS VS. HOMEMADE DIETS: CHANGES IN THE PROFILE OF DOG AND CAT OWNERS

In 2007, a *recall* that occurred in the United States with products manufactured by the Canadian company *Menu Foods*, may have been the great precursor for the interest of tutors in new food alternatives for dogs and cats. Between March and April of the same year, the company announced the withdrawal from the market of 60 million canned goods intended for pet consumption. At the time, deaths of 16 animals with kidney and liver failure were confirmed, according to the *Food & Drug Administration* (FDA, 2023).

Wheat gluten imported from China, contaminated with melamine (C3H6N6), was identified as the causative agent. This organic compound is produced from urea, being used in the plastic industry, as well as a by-product of various pesticides (SAAD & FRANÇA, 2010).

This incident took on great proportions, which aroused the interest of dog and cat owners about the ingredients present in industrialized products (SAAD & FRANÇA, 2010).

Thus, many products with natural appeals are emerging on the market (PHILLIPS, 2007):

- Chilled fresh food;
- Raw foods;
- Organic food;
- Grain-free foods;
- Natural foods;
- Ingredients with human quality standards;
- Exotic ingredients;
- Superpremium;
- Ultrapremium;
- Home-cooked meals enriched with supplements;
- Meat-centric dietas;
- Diets based on protein (*protein focused*).

In addition to niche diets such as: skin and coat health, intestinal health, oral health, urinary tract health, senile animals, athlete animals and puppy training (PHILLIPS, 2007).

Many pet owners revealed distrust of commercial foods (HEINZE, 2014). In a study carried out by Oliveira et al. (2014) it was observed that in 6.5% of the cases in which the animals received a homemade diet, the option was taken by the tutor who thought this diet was the healthiest. The role that diet and nutrition play in maintaining health and in the prevention, or treatment of diseases, is something that, in general, is within the reach of most people, even if they do not understand the nutritional science involved (MICHEL, 2006).

The inability to understand the label of pet food and the concern about the nutritional value, as well as the types and sources of the ingredients used in extruded diets are possible motivations for owners who opt for alternatives in their pet's diet. Additives, preservatives, dyes and flavorings arouse some anxiety about the impact of the long-term ingestion of these substances on the health of these animals (MICHEL, 2006; PEDRINELLI et al., 2017).

The encouragement of homemade diets is also based on the beliefs that there is greater control over ingredients and greater preservation of enzymes and phytonutrients than in extruded raw materials; homemade foods resemble the natural diet of ancestral dogs; and commercial foods may be less nutritious or have lower palatability. There is also the desire to please the pet, understand it as a member of the family, strengthen the human-animal bond and the attempt to achieve clinical advantages with diet (TEIXEIRA & SANTOS, 2016).

For Berschneider (2002), as pet owners become more aware of their own diets and the impact they have on their health, they naturally become more interested in what their animals consume and many start to explore new alternatives to commercial foods.

TYPES OF HOMEMADE DIETS, WITH EMPHASIS ON BARF AND *PREY MODEL*

Currently, tutors can choose to buy or prepare natural food for their pets. However, the formulations must be prepared by nutritionists who specialize in dog and cat nutrition. An unbalanced diet in energy and nutrients, as well as the supply of homemade mixtures or leftovers, pose great risks to the health of animals (COUTO & CORTE REAL, 2019).

The main modalities of homemade diets in Brazil, according to Couto & Corte Real (2019) are: cooked and raw homemade diets.

In cooked homemade diets, the foods used resemble the foods consumed by humans, containing carbohydrates, proteins, and various vegetables, such as legumes and leaves. These foods can be cooked in water, steamed or baked (REMILLARD & CRANE, 2010).

For raw homemade diets, two modalities are best known: BARF and *prey model*. BARF is an acronym for the English expression "*biologically aproppriate raw food*" (BILLINGHURST, 2001).

The principle of this diet is the supply of meat, bones and offal, all in their raw or "*in natura*" form, based on the similarity to the ancestral diet of dogs. In addition, in this modality, the inclusion of ingredients rich in carbohydrates, such as grains, and also vitamin-mineral supplements is avoided (COUTO & CORTE REAL, 2019).

The prey model *modality*, which in free translation means prey model, provides the opportunity for domiciled dogs and cats to consume a diet that replicates the diets of wild animals, without them having to hunt for their own food. In this modality, the proportion of ingredients is divided into 10/80/10, with 80% boneless meat, 10% edible bone-in meat, and 10% offal, 5% liver and 5% other types of viscera (PERFECTLY RAWSOME, 2023).

For Couto & Corte Real (2019), defenders of raw homemade diets report that dogs have excellent acceptability, especially because these diets offer varied formulations. Owners also believe that such diets present:

- Natural biological antioxidants;
- Greater digestibility of fats and low level of carbohydrates;
- Improved essential amino acid profile;
- Muscle improvements, which allow greater physical activity;
- Oral health, with good breath and clean teeth;
- Healthy skin and shinier hair;
- No nutritional loss, as it is not subjected to heat treatment;
- Decreased body fat, with less predisposition to obesity;
- Reduction of allergies and other diseases;
- Lower triglyceride and cholesterol levels.

However, Couto & Corte Real (2019) comment that raw homemade diets have important disadvantages, which can cause nutritional deficiencies if there is no balance of nutrients. Among these, the following stand out:

- lower digestibility of protein and amino acids;
- Risk of accidents such as choking, tooth injuries, mouth wounds and perforation of internal organs;
- Risk of bacterial infections;
- Greater dedication of tutors to food safety.

França (2009) evaluated the digestibility of six different diets: a) a dry (extruded) diet, b) a wet diet, c) a homemade diet with raw chicken, d) a homemade diet with chicken heated for three minutes in a microwave, e) a homemade diet with raw beef, and f) a homemade diet with beef heated for three minutes in a microwave. It was observed that the digestibility of crude protein in dry and wet diets was lower than in homemade diets, and fat digestibility was higher in homemade diets of

chicken and cooked beef. For the dry matter digestibility coefficient, the dry diet did not differ from the homemade raw beef-based feed, but was lower than the other feeds. However, again, the composition of the diets used was different in terms of fat and fiber contents, which may have interfered with the results of the study.

Regarding food preference, Zanatta et al. (2016) demonstrated that dogs prefer cooked meats over raw meats, but that many factors can influence this result, such as the fat content of the food.

VULNERABLE POINTS OF RAW HOMEMADE DIETS

Thousands of dogs and cats are given homemade diets. And often these diets are deficient in essential nutrients like calcium, iron, and taurine, which can lead to fractures, anemia, and heart problems. Feeding pets with raw meat-based diets has become an increasingly popular trend among pet owners, however, this practice does not exempt the pet owner from food safety risk issues. The risks of biological contamination, especially salmonellosis, toxoplasmosis and various worms, are the weak points of raw natural diets (SAAD & FRANÇA, 2010). The raw materials used for the preparation of these diets do not undergo any type of heat treatment or sterilization, and can maintain the bacteria and parasites existing at the time of consumption of the food by the animals (FINLEY et al., 2007).

Billinghurst (2001) suggested that these pathogens are harmless and, exceptionally, adapted to the canine intestinal tract. There are no reports documenting clinical salmonellosis in dogs fed the BARF diet, however, clinical pictures of *Salmonella* sp. are well described in dogs (GREEN, 1990; LEJUNE & HANCOCK, 2001).

There is little information on the duration of colonization of *Salmonella spp* in dogs, however, it has been widely cited that once infected, a dog may shed *Salmonella* organisms in its feces for six weeks or more, continuously for the first week, and then intermittently (MORSE et al., 1976; SANCHEZ et al., 2002).

Salmonella *contamination* in pets is of utmost importance, as they can be a source of potential infection for humans, particularly high-risk individuals such as children, the elderly, and immunocompromised individuals (WEESE et al., 2005).

Usually raw natural foods are kept refrigerated and frozen. In the case of refrigeration, temperatures are between 0 and 7ºC. In this case, the impacts on nutritional and sensory properties are milder, but the conservation times are shorter. For freezing to be efficient, temperatures of -18ºC or lower are required. There are microorganisms that still grow at -10ºC, which poses a danger for poorly monitored freezing. It is known, however, that at a temperature of -18ºC or less, some microorganisms are inhibited (SAAD & FRANÇA, 2010).

Major institutions such as *the American College of Veterinary Nutrition* (ACVN), *the World Small Animal Veterinary Association* (WSAVA), *the American Animal Hospital Association* (AAHA), *the Center for Disease Control and Prevention* (CDC), and *the Food & Drug Administration* (FDA) are against the practice of raw food for dogs and cats.

With regard to nutrition, according to Couto & Corte Real (2019), in several studies involving the nutritional composition of homemade natural diets for dogs and cats, it is observed that the vast majority do not meet all the recommendations for nutritional requirements based on the species' recommendation manuals. The main nutritional imbalances described were energy deficiency, excess or deficiency of protein, deficiency of calcium and phosphorus, imbalance of trace minerals and deficiency of vitamins.

Pedrinelli et al. (2017) evaluated the nutritional profile, through the use of *software*, of 106 homemade diets (80 for dogs, 24 for cats, and 2 for dogs and cats), published in books and *websites*. Of these, none met the needs according to FEDIAF (2017). The main deficiencies found in the diets were iron (deficient in 100% of the diets for cats and 68% of the diets for dogs), vitamin E (with more than 80% of diets deficient for both species) and calcium (with 73% of diets deficient for both species). In addition, 71% of the diets did not inform the recommended amount of food intake.

Another difficulty encountered in the formulation of homemade diets is regarding the chemical composition of food ingredients, generally using food profiles for humans (COUTO & CORTE REAL, 2019). For raw homemade diets, the problem can be even greater, since important minerals such as calcium and phosphorus, present in bones, are not accounted for.

The main chemical composition tables used in the preparation of homemade diets are: Brazilian Food Composition Table (TACO), USP Food Composition Table, Food Chemical Composition Table (TABNUT, 2023) and *National Nutrient Database for Standard Reference,* which do not include the composition of cuts with bones (COUTO & CORTE REAL, 2019).

NUTRITIONAL REQUIREMENTS OF HOMEMADE DIETS FOR DOGS AND CATS

FEDIAF is a trade organisation representing the European pet food industry. Fifteen national trade associations and five companies (*Affinity Petcare, Hill's Pet Nutrition, Mars PetCare, Nestlé Purina Petcare and Wellpet*) are members of FEDIAF.

FEDIAF (2021) has compiled the manual "Nutritional Guidelines for Complete and Complementary Foods for Dogs and Cats", providing pet food manufacturers and food formulators with nutritional recommendations that ensure the production of balanced and nutritionally adequate foods.

This manual is based on published scientific studies, including the *National Research Council* (NRC, 2006), as well as published and unpublished data from experts in the field (EUROPEAN PET

FOOD, 2023), and is therefore reviewed annually and updated whenever there are new technological, scientific, or legislative advances regarding pet nutrition (FEDIAF, 2021).

The nutritional needs of dogs and cats are the subject of ongoing research. When formulating pet food, FEDIAF (2021) recommends that manufacturers do not use minimum requirements references, but rather minimum recommended amounts that ensure adequate nutrient intake, as proposed in the manual.

Providing a balanced diet with minerals is essential for the health and maintenance of pets, as they play vital roles in numerous metabolic functions, from the formation of bones and teeth to the maintenance of bodily fluids, muscle function, and other physiological processes. Among the trace minerals necessary for the diet of dogs and cats, iron, zinc, copper, iodine, manganese, selenium and molybdenum can be mentioned, and among the macrominerals, calcium, phosphorus, magnesium, potassium, sodium, chloride and sulfur. It is worth noting that calcium and phosphorus are primordial.

Calcium (Ca) is the most abundant mineral in the body, and approximately 98% is found in the composition of bones and teeth. The rest of the calcium is distributed in extracellular fluids and other tissues. Calcium is involved in blood coagulation, cell permeability, muscle contraction, transmission of nerve impulses, cardiac regulation, hormone secretion, and enzyme activation (REECE et al., 2017). Calcium intake must be balanced with phosphorus (P) intake for healthy bone growth and maintenance (GRANDJEAN & BUTTERWICK, 2009).

All nutritional guidelines state that the Ca:P ratio is as important as meeting the needs of these nutrients in diets. For dogs, the ideal ratio between these minerals is 1:1, both for the adult phase and for the growth phase, so it can reach up to 2:1 for adult dogs; 1.6:1 for early-growing dogs (≤ 14 weeks) and 1.8:1 for late-growing dogs (≥ 14 weeks). For cats, the ideal ratio is also 1:1 for both the adult and growth phases, and it may be safe to reach 2:1 for adult cats and 1.5:1 for growing cats (FEDIAF, 2021).

Diseases caused by Ca deficiencies were once common in small animal clinics, however, with the diffusion of industrialized and nutritionally adequate foods, these pathologies have become rare. With the great demand of tutors for homemade diets, diseases such as osteoporosis, rickets, osteomalacia and secondary nutritional hyperparathyroidism have been more frequent nowadays.

This is because homemade diets of all types are available on *websites* and books for free and easily accessible, and often these diets are not balanced to meet the nutritional requirements of dogs and cats, causing serious health problems (NAP et al., 2000; RICHARDSON et al., 1997).

Tutors who follow the BARF and *prey model* diets do not take into account the use of supplements or supplements to correct deficiencies and deficiencies of nutrients, including calcium

and phosphorus. This is because they believe that a raw diet, more similar to that of the ancestors of dogs, is enough to ensure nutritional balance (LONSDALE, 2001).

Calcium can be found in mammalian and bird bones. Dairy also contains significant amounts of calcium. Broccoli and cabbage are moderate sources when discounting the moisture of the food. Common mineral salts include calcium carbonate, calcium sulfate, calcium phosphate and calcium amino acid chelate (GRANDJEAN & BUTTERWICK, 2009).

Phosphorus is the mineral that has the largest number of known functions, being involved in almost all aspects of animal metabolism, including energy metabolism (part of adenosine triphosphate - ATP), muscle contraction, nervous tissue function, metabolism of carbohydrates, fats and amino acids, acid-base balance, transport of metabolites, in addition to participation in the structuring of nucleic acids and the lipoprotein membrane of cells.

In addition, 80% of phosphorus is found in bone tissue and teeth, and together with calcium, it gives them structural rigidity. Particularly in bones, together with calcium, it is mainly in the form of hydroxyapatite crystals, in an approximate ratio of two parts calcium to one part phosphorus (CARCIOFI, 2023).

Thus, the lack or excess of these important macro minerals can cause harm to pets. Complete and balanced commercial diets have relatively high concentrations of calcium and phosphorus, and reports of deficiencies in dogs are absent in the literature, when it comes to this type of food (BÖSWALD et al., 2019; NAP et al., 2000; RICHARDSON et al., 1997).

From the 90's onwards, problems related to nutritional excesses have been much more frequent, especially if a balanced growth ration is supplemented with minerals, vitamins and energy (RICHARDSON et al., 1997)

For growing animals, the nutritional imbalance of calcium and phosphorus, as well as their relationship, is even more serious. Developmental osteoarticular alterations can occur due to changes in the intake of calcium, phosphorus, vitamin D, protein, copper, zinc, manganese and vitamin A. Vitamin D is a steroid whose biological activity is closely associated with the metabolism of calcium and phosphorus, being extremely important in the homemade diets of adult and growing dogs and cats. In addition to bone deformities, phosphorus deficiency can result in slow growth and impaired appetite (LEPINE & REINHART, 1998).

Like calcium, phosphorus can also be found in bones and especially in meat and offal (GRANDJEAN & BUTTERWICK, 2009). Among the mineral salts can be included dicalcium phosphate, monobicalcium phosphate, monoammonium phosphate, among many others (ROSTAGNO, 2005).

Moura (2023) evaluated the composition of calcium and phosphorus in raw homemade diets with bones, in the BARF and *prey model modalities,* for adult and growth dogs (up to 14 weeks and

after 14 weeks) and compared them with the recommendations of FEDIAF (2021), in addition to evaluating the relationships between these two nutrients. Of the 30 formulations analyzed, none reached the minimum values of calcium, phosphorus and Ca:P ratio recommended, with calcium being the nutrient with the highest incidence of values below the recommendation. In addition, calcium and phosphorus deficiencies for growing dogs were much higher compared to adults. These results show the presence of nutritional inconsistencies in the recommendations proposed in the researched websites and reinforce the need for care when formulating a raw homemade food for pets, in different physiological phases.

In short, it is extremely important for tutors to recognize the need for the formulation of diets by a trained professional, with technical-scientific support on the essential nutrients and their adequate amounts, in order to provide balanced and satisfactory homemade diets for the correct development, well-being and longevity of dogs and cats.

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Teleclassroom methodology as a tool for correcting school flow with emphasis on the principles of solidarity economy

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Rosicleide da Silva Bezerra[1], Lenilde Mérgia Ribeiro Lima[2] and Lígia Maria Ribeiro Lima[3]

ABSTRACT

One of the major concerns in the area of education has been the low teaching-learning ratio. As a result, some tools have been used in the classroom to increase the efficiency of student learning. The Telessala methodology bets on the technology of video classes to enable the completion of basic education. Thus, the present work aimed to analyze the possible use of this methodology in the teaching of the Solidarity Economy theme in a class of the Alumbrar project, in the final years of Elementary School, in a state school in the municipality of Sumé-PB. This project focuses on promoting the correction of the school flow of students aged between 13 and 17 years. To this end, bibliographic and field research and qualitative methods were used. For data collection, a semi-structured questionnaire was used, which was applied to the students and the teacher of that class. According to the data analysis, it was concluded that the project developed from the perspective of the Telessala methodology brought numerous contributions to the formation of the students, as there was progress both in the personal and social spheres, as well as in the educational one. Thus, it was realized that the methodology used in the project is viable for the teaching of Solidarity Economy, since it provides an alternative for insertion in the world of work, as well as the strengthening of the perception of citizenship by students.

Keywords: ALUMBRAR Project, Youth Education, Telessala Methodology, Solidarity Economy.

[1] Specialist in Youth and Adult Education with Emphasis on Solidarity Economy
[2] Professor at the Federal University of Campina Grande (CDSA/UFCG/Campus Sumé) – PhD in Inorganic Chemistry
[3] Professor at the State University of Paraíba (DESA/UEPB/Campina Grande Campus) – PhD in Process Engineering

INTRODUCTION

From colonial Brazil to the present day, several changes have occurred in the history of education, all to meet the demands of each era, as well as to meet a specific audience, such as the Alumbrar project, which was introduced in the educational context of Paraíba since 2014, with the objective of correcting the school flow for a group of students aged between 13 and 17 years, who are or were attending the final grades of Elementary School.

To serve this clientele with regard to education, the Telessala methodology is used, which proposes a teaching-learning based on the use of some media, such as television and DVD. This methodology is adaptable according to the needs of each group, that is, it allows a flexible curricular organization, which allows the inclusion or exclusion of some curricular content from its structure to meet a specific reality.

In a society marked by social inequality, caused by the capitalist system, the Solidarity Economy (HE) comes as a possibility of changing life and it is through education that it will gain strength to expand, becoming more than an alternative for generating employment and income, that is, a different way of living with more quality. Such an economy presents itself as a form of organization that the subjects have in a collective and solidary way to maintain themselves or insert themselves in the world of work, generating employment and income, where everyone has the same rights and duties.

The school environment is conducive to discussions about HE, since it is where students are graduating in Basic Education. In this teaching perspective, there is the Telessala methodology which, like the Solidarity Economy, has an education focused on the transformation and development of the student.

Thus, in order to identify the relationship between the Telessala methodology and the teaching of Solidarity Economy, the following question is asked*: What are the characteristics of Solidarity Economy that are also present in the pedagogical practice of the Alumbrar project, more precisely in the Telessala methodology?*

Thus, the theme aroused the interest for this study, which aims to analyze the possible insertion of the Telessala methodology of the Alumbrar project in the development of the Solidarity Economy theme in a school of the state education network, in the municipality of Sumé-PB.

STRATEGIES FOR LEARNING EFFICIENCY

It is known that the challenges proposed in the world of work are several and, therefore, education needs to take into account the transformations that occur in this environment. Therefore, teaching-learning should prove to be efficient with regard to the formation of the citizen.

In this sense, learning strategies are presented as sequences of procedures and activities that outline facilitating the acquisition, selection, storage or use of information (POZO, 2002).

In order to be successful in the use of strategies to ensure the effectiveness of learning, it is necessary to consider the student as a subject of learning. Therefore, the teacher needs to place the student in situations in which his global activity is mobilized, which manifests itself in intellectual activity, activity of creation, verbal, written, plastic or other type of expression. The center of school activity is not the teacher or the subject, it is the active student and researcher (LIBÂNEO, 1994).

In this perspective, the Alumbrar project is presented, which was implemented in the state education network of the state of Paraíba through Resolution No. 167/2014. The project aims to promote the correction of the school flow of students enrolled in the final years of elementary school, that is, it presents itself as a stage of basic education focused on elementary school. It is worth mentioning that, according to Resolution No. 167/2014, it is not configured as a modality of Youth and Adult Education, but only for young people, presenting its own methodology and schedule. In addition, the project is defined as an integrated pedagogical action. To form a class, it is necessary to have 20 to 30 students and they must be at least and maximum in age, respectively, 13 and 17 years old, with the learning environment being a single room with specific materials, with the implementation of telerooms and with the teacher as a learning mediator (FUNDAÇÃO ROBERTO MARINHO, 2013).

The Alumbrar project is developed in partnership between the Government of the State of Paraíba and the Roberto Marinho Foundation. Its curriculum is subdivided into three modules, the first lasting two semesters, the second and third lasting one semester each, in which the curricular components are introduced, which are taught by a single professor trained by the Roberto Marinho Foundation in the Telessala methodology. Other multidisciplinary activities and Complementary Pedagogical Projects can also be added to each module, with the theme chosen according to the needs of the clientele (FUNDAÇÃO ROBERTO MARINHO, 2013).

The project presents in its curriculum the complementary pedagogical project in order to relate Education and Culture in the context of sustainable development. In this way, during the development of the project, the student and also the teacher will together value the local culture, in order to observe sustainable development in practice.

In the development of the classes of the Alumbrar project, students always work as a team, which is of fundamental importance for them to develop this competence, since when they are inserted in the job market they will need to interact in a group, whether to exchange ideas, cooperate in activities, among others. In the course of an interview, Perrenoud (2000) defines competence as the ability to mobilize a set of cognitive resources (knowledge, skills, information) to solve a series of situations with pertinence and effectiveness (GENTILE; BENCINI, 2017). Thus, knowing how to

orient oneself in an unknown city mobilizes the ability to read a map, locate oneself, ask for information or advice, which entails the following knowledge: having a notion of scale, elements of topography or geographical references (PERRENOUD, 2000).

Learning situations in the classroom should provide the student with the development of skills so that he is able to solve situations present in his daily life.

The classes of the Alumbrar project, lasting 4 hours a day, are divided into three distinct moments: in the first moment, the teams are summoned to carry out an integrative activity, inserting the problematization related to the two teleclasses; Then, the first class is shown, followed by the image reading and, finally, a group activity is carried out with the textbook. In the second moment, the second teleclass is shown, followed by the image reading and group activity with the textbook referring to the second class. This is followed by the third moment, which is dedicated to the socialization of learning and the presentation of synthesis and evaluation (FUNDAÇÃO ROBERTO MARINHO, 2013).

The entire program is based on books and DVDs from the elementary school of Telecurso 2000, from the perspective of the Telessala methodology.

TELESSALA METHODOLOGY

The educational process has been going through several changes and implementations of educational modalities over the years, in order to correct the school flow, among them the Telessala methodology, which is understood as a result of a collective, organic and evolutionary process that, since its beginning, feeds on the implementation process, transforming itself by transforming those who use it, being at the service of Basic Education (FUNDAÇÃO ROBERTO MARINHO, 2013).

The Telessala methodology has the following characteristics:

- **Progressive**: contributes to social transformation with sustainable development and justice.
- **Libertarian:** contributes to people developing autonomy to make choices and grow by solving problems.
- **Multicultural:** contributes to the appreciation and dialogue between different cultures in the neighborhood, in the city, in the country, in the world.

For the Roberto Marinho Foundation (2013), the Telessala methodology is a proposal aimed at the world of work, for the development of competence and for the formation of citizenship, which enables access to the completion of Basic Education, with quality and at flexible times.

Gadotti (2003) highlights sustainability as a necessary and urgent theme to be dealt with in the educational scenario for its relevance, that is, education, in the multicultural sense, is presented as proposed by the Telessala methodology, since education its objective is to make the student no longer

an accumulator of knowledge, but learn to think and share a greater good, which is planet earth, understanding the need to value it.

The Telesala methodology has been applied since 1993. All the activities developed in the classroom result from a set of processes, methods, procedures and materials that have roots in the practices developed in the 1970s and 1980s in Brazil, inspired by Paulo Freire, Freinet, Piaget, Anísio Teixeira. This methodology is divided into five movements: integration; contextualization; socialization of the Telesala Methodology; problematization and reflection; and practical application. This methodology is applied at the initiative of governments, as a public policy to end the age-year distortion, promote youth and adult learning in schools, or at the initiative of community entities, companies and NGOs (FUNDAÇÃO ROBERTO MARINHO, 2013).

The Telessala methodology has been gaining space in the education scenario and, in 2009, it was included in the MEC's educational technologies guide, more precisely in the Igarité Project, in the State of Amazonas. This was possible due to the fact that this methodology has as a strong point the use of audio and video by satellite, as well as internet connection, and in 2011 the teleclasses were made available on the Globo.com, on the Telecurso channel on YouTube and on the Telecurso website. In 2012, the classes were made available on "facebook" and "twitter" (FUNDAÇÃO ROBERTO MARINHO, 2013).

In this way, the Telessala methodology uses some technological resources that are available to society in various spaces of the student's daily life, which, according to Belloni (2005), it is necessary to bring this resource closer, although one cannot lose the focus of teaching, but provide opportunities for use as a learning strategy. Such resources allow the viewing of classes that are on DVDs or can be purchased over the internet.

In this sense, an education with applicability needs to refer to the ideas defended by Freire (1987), with regard to education. Freire was against banking education, which classifies the student as a receiver of knowledge and the teacher as the one responsible for transmitting knowledge. The Telessala methodology suggests a model of education focused on the transformation of the being, since there is a model of participation in the classroom in which every teacher learns (is a student) and every student teaches (is a teacher), that is, teacher and student learn together (FUNDAÇÃO ROBERTO MARINHO, 2013).

The educational process emphasizes teaching that meets social practices in the context of the world of work, which value sustainable development, solidarity, training for citizenship, justice and, above all, dialogue.

EDUCATION AND SOLIDARITY ECONOMY (ES)

According to the Federal Constitution, in its chapter III, education is "a right of all and a duty of the State and of the family, it will be promoted and encouraged with the collaboration of society, aiming at the full development of the person, his preparation for the exercise of citizenship and his qualification for work" (CONSTITUIÇÃO FEDERAL, 1988, p.148).

Regarding school education, the Law of Guidelines and Bases (LDB – law nº 9394/96) states that it should be linked to the world of work and social practice (LDB, 1998, p.31), that is, both national and school education should contribute to the formation of the subject in the sense of providing sufficient conditions for the future professional to be able to act in the social context and in productive activities.

The LDB highlights that access to education is a subjective public right, and any citizen, group of citizens, among other forms of organization or individual, can demand access to education from the public authorities. In addition, in its article 4, item VII, it states that it is the duty of the State to offer regular school education for young people and adults, with characteristics and modalities appropriate to their needs and availability, guaranteeing those who are workers the conditions of access and permanence in school (LDB, 1998).

It is in this perspective of subjective right and in the search for the effectiveness of school education that needs to have as its objective not only basic training, but the direct contribution to training focused on the world of work, that Solidarity Economy is presented, in the sense listed by the Brazilian Forum of Solidarity Economy (2011).

For a long time, the economic scenario was dominated by a so-called capitalist economy that is characterized, according to Singer (2005), by the concentration of ownership of the social means of production in a few hands, that is, the employee had no right to participate in any decision within the company.

In the course of this scenario, another form of economy is proposed, whose basic principles are collective or associated property and the right to individual and collective freedom. According to the Brazilian Forum of Solidarity Economy (2011), it is understood in its economic sense as being a way of carrying out the economic activity of production, supply of services, commercialization, finance or consumption based on democracy and cooperation, which is called self-management: that is, in the Solidarity Economy there is no boss or employees, because all the members of the enterprise (association, cooperative or group) are at the same time workers and owners.

According to Gadotti (2009), what differentiates a solidarity company from a capitalist company is that the Solidarity Economy focuses on improving the quality of life of the associates while the other only has the owner as a beneficiary. There are several ways of expressing a solidarity enterprise, understood as: initiative of collective productive projects, popular cooperatives,

cooperatives for the collection and recycling of recyclable materials, production, commercialization and consumption networks, financial institutions focused on popular solidarity enterprises, self-managed companies, family farming and agroecology cooperatives, service cooperatives, among others, which boost the local economies, guarantee decent work and income to the families involved, in addition to promoting environmental preservation (BRAZILIAN FORUM OF SOLIDARITY ECONOMY, 2011).

For Singer (2017), an enterprise is considered solidary if all those who are part of it can have the same rights to participate in decisions that affect the company and, therefore, each one of them. In this way, each member is the owner and also responsible for keeping the company in operation and the principle of equality must still prevail in the sense that all work must be shared, and each member performs a specific activity, and the work is completed in a shared way (SINGER, 2002).

In this same perspective, Kruppa (2005) sees the Solidarity Economy as an economy with the defense of equality and inclusion of all, not postulating, however, the defense of the identical. An economy that considers that people are different and should have space for the exercise of their differences, which refers to the idea of a strategy of job generation fueled by respect for differences as a strong point of the enterprise.

In general, the Solidarity Economy is understood as being a different way of producing, selling, buying and exchanging what is needed to live. While in the conventional economy there is a separation between the owners of the business and the employees, in the Solidarity Economy the workers themselves are also owners. They are the ones who make the decisions on how to run the business, divide the work and share the results (MINISTRY OF LABOR AND EMPLOYMENT, 2016).

For Singer (2005), collective re-education represents a pedagogical challenge, as it is about passing on to each member of the group another vision of how the market economy can work and of the cooperative relationship between partners. Thus, re-education highlights as a principle the valorization of work and shared withdrawals so that everyone feels valued, which raises self-esteem and directs them towards self-management.

In a similar sense, Arruda (2005) highlights the importance of the individual understanding that in this way of promoting the Solidarity Economy, now self-managed, he needs to recognize the importance of solidarity exchange considering that everyone, that is, buyer and seller must seek collective gain and the main objective of a solidarity market is that the financial part circulates in the surroundings of the community since production, Sale, commercialization and exchange should directly benefit the population. Another fact to consider is that the moment of commercialization must go beyond the sale and also contemplate social and human relationships.

THE TELECLASSROOM METHODOLOGY IN THE TEACHING OF SOLIDARITY ECONOMY

The Telessala methodology consists of a pedagogical practice based on an education committed to three dimensions: progressive, libertarian and multicultural, which allows teaching aimed at meeting the needs of life and work of young people and/or adults (FUNDAÇÃO ROBERTO MARINHO, 2013).

According to the Guidelines of the Alumbrar project, students, in a period of two years, in which the three modules take place, build documents based on the Telessala methodology, such as: memorial, PLLP (Free Portuguese Language Path), PLM (Free Mathematics Path), PPC (Complementary Pedagogical Project) and Teams. In the organization of the methodology, according to the guidelines of the Alumbrar project, there is the formation of teams consisting of four groups with specific attributions, namely: socialization, which consists of carrying out the initial moment by proposing a reflection that can be a song, reflection text, among other means; coordination, which is a team responsible for organizing the room and distributing the materials necessary to develop the activities; synthesis, responsible for synthesizing what was taught in terms of concepts and presenting them; and, finally, the evaluation, which analyzes the process at the end of each class, according to the agreement with the group. In other words, the teams during the classes mobilize in the search for a collective learning environment, thus making each one responsible for the whole, with an emphasis on personal, social, school and professional training (GUIDELINES OF THE ALUMBRAR PROJECT, 2014).

For the teaching-learning process to occur, it is necessary to think about the methodological proposal used for the development of the contents. In this sense, the Telessala methodology is a relevant methodological proposal for the teaching of Solidarity Economy, since it highlights the fundamental role played by the teams that are formed with the class. These teams become responsible, together with the class mediator, for the activities that occur during the class, play a role in the class and at the same time study the contents, this means that everyone is responsible for the teaching-learning process. In this methodology, students are encouraged to share, to perform collective work, to be supportive. The methodological procedures developed in the classroom become similar to what occurs in solidarity enterprises where everything depends on the collaboration of the members. Thus, teaching based on these procedures would lead to the same education that the subjects who participate in the Solidarity Economy enterprises should have.

METHODOLOGY

The present research is characterized as bibliographic and also field, according to Medeiros (2010). It is bibliographic, as its research source is a scientific document characterized as primary and secondary, which presents updated information found in books, newspapers, articles, reports. It

is a survey of the bibliography related to the subject that is intended to be studied, having followed the following steps: *Identification*, which deals with the bibliographic collection that exists on the subject in question; *location*, which is the phase after the bibliographic survey and means the location of specific works, in order to obtain the necessary information and *compilation*, which is characterized as the phase of obtaining and gathering the desired material.

It is a qualitative method, as it aims at an attempt to understand in detail the meanings and situational characteristics presented by the interviewees, instead of producing quantitative measures of characteristics or behaviors (RICHARDSON, 2009).

For data collection, a semi-structured questionnaire was used, applied to a class of the Alumbrar project of the final years of Elementary School belonging to the state education network, in the municipality of Sumé-PB and to the respective teacher of the class. The class focuses on age/year correction for students in the age group of 13 to 17 years who are enrolled in the final years of elementary school. This class belongs to the State School of Elementary and High School Professor José Gonçalves de Queiroz, and is composed of 13 students. Five (5) students from the class were interviewed. It is worth noting that of these 13 students, only 08 attended classes. Tables, charts and graphs were used for the presentation of data.

The pedagogical proposal of this class is modular, and in the first module the guiding theme is "The human being and its expression: WHO AM I?". The second portrays "The human being interacting with space: WHERE AM I?" and the third "The human being in action: WHERE AM I GOING?". In this case, the objective is an education for the development of the being (FUNDAÇÃO ROBERTO MARINHO, 2013).

RESULTS AND DISCUSSION

To present the results obtained from the questionnaire, the participants were called alphabetical burn (A, B, C, D, E), so that their identity is preserved.

Regarding the age of the participants, the results are illustrated in Figure 1.

Figure 1 – Age group of the beneficiaries of the Telessala methodology in a school in the municipality of Sumé-PB.



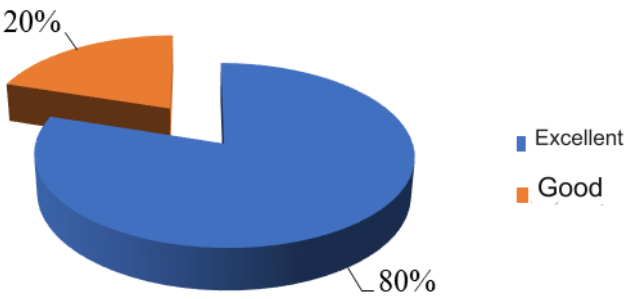
Source: Survey data, 2017.

From Figure 1, it can be observed that 60% of the student public in the class, benefited by the Telessala methodology, are 15 years old and 40%, 16 years old. It is a homogeneous group in relation to age group. Resolution No. 167/2014, which deals with the implementation of the Alumbrar project, highlights that these students would be in a different age group from the one that would be considered appropriate, according to the LDB 1998, to be enrolled in the final years of elementary school.

According to the students' reports, one of the main reasons for the students to have been enrolled in the project was the advanced age group for them to enter regular education.

The evaluation of the project by the students is illustrated in Figure 2.

Figure 2 – Evaluation of the project from the students' point of view.

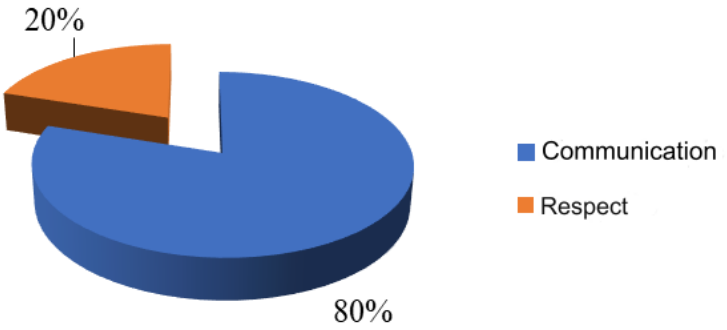


Source: Survey data, 2017.

Figure 2 shows that the program is well accepted by the students, since 80% evaluated the project as excellent, 20% evaluated it as good and none evaluated it as bad.

Regarding the competencies developed, communication and respect stand out, as observed in Figure 3.

Figure 3 – Skills developed from the Alumbrar project.



Source: Survey data, 2017.

As illustrated in Figure 3, it can be seen that the students list that the main competence developed was communication (80%), as was already predicted by the Roberto Marinho Foundation when it presented an education in the multicutural sense, in which dialogue was present. The remaining 20% indicated that respect was the main competence developed from the project.

Regarding liking or disliking the project's classes, the students stated that they like it.

Regarding the knowledge of the project's objectives, the students associated the project with learning and adapting the study series to the age group of the target audience.

The importance of group work was also highlighted, with the students highlighting the importance of group work for the development of all, both in relation to the knowledge acquired and in social relationships.

When asked if their opinion was respected during the classes, all of them answered that they were always respected.

Regarding the appreciation of the student in the classroom, with the application of the Telessala methodology, the answers were positive. The students of the Alumbrar project feel valued because they are not discriminated against due to the homogeneity of the class.

When asked about the benefits of the project, the students' conclusion was unanimous that the project was extremely important for their social and educational development.

Regarding the changes that occurred after participating in the project, the answers were positive and the students presented in their writings that the project was very important, since it contributed to them rescuing the desire to continue their studies, in addition to contributing to personal development.

The students were also questioned about the relationship between the learning acquired through the project and their contribution in the work area, having concluded that the project

collaborated for a better relationship with society, in addition to increasing their knowledge, which is very beneficial for the development of their work.

Regarding the option of group or individual work, most answered that group work is better, as there is greater interaction between people, as well as the exchange of knowledge.

Regarding the positive and negative aspects that students perceive in the Telessala methodology, the students pointed out as positive points the approximation of people, working together, help in school development and better learning. As a negative point, one student points out the lack of material.

Regarding the behavior of the students in the class, all the students interviewed stated that half of the class was attentive to the classes.

Regarding the improvement in the social context from the study in the Telessala methodology, the interviewees highlighted that they developed an improvement in the performance in the social context from this methodology, since they report the development of communication and the improvement in the understanding of other situations.

The students described that the Telessala methodology contributed to them thinking about their life project. In addition, they mention the project as a learning opportunity.

As for the contribution of the methodology for them to become a critical being, the answers obtained showed that the Telessala methodology contributed, since some students developed the dialogue, leaving aside shyness. In addition, their opinion was always requested in the works.

Regarding the students' knowledge regarding the meaning of SS, it was observed that the students have some knowledge about the objectives of the Solidarity Economy.

Regarding the questioning regarding the importance of HE for contemporary society, the students found the presence of the Solidarity Economy in today's society important. According to them, HE will bring benefits, such as: mutual aid, reduction of social inequality, equal rights for all, in addition to generating work and promoting social inclusion.

Considering that associations and cooperatives are the trademark of the Solidarity Economy, it was asked if the students believe that all of them are genuinely solidary and all answered no.

Considering that, based on equality and solidarity, the Solidarity Economy values the collectivity, the common good, it was questioned whether the students see the capitalist system in this way and, for the students, the Solidarity Economy does not follow the same ideas as the capitalist economy, because they consider that the individuals who participate in the capitalist economy do not think about the good of others, there is exploitation.

For the students, it is important to discuss HE in the school environment, as it would lead them to learn about another form of work, in addition to knowing values such as equality.

CONCLUSIONS

According to the data presented in the research, it was noticed that the project developed from the Telessala methodology brought numerous contributions to the formation of the students, since the project contributed to the personal, social and educational development and development of skills, such as: communication, respect, collectivity, cooperation; development of dialogue, which can favor the student to become critical in the face of the various situations present in his daily life.

In addition, the development of teamwork is important for everyone's progress, as well as the exchange of knowledge. With this, the students developed relationships among themselves, which provides a better relationship in society within the social context and in the world of work. It was also found that the methodology used in the project values the student and respects his opinion.

The content was not worked on in the classroom, however the investigated public considers it relevant to discuss it in the school environment.

It is understood that discussing the Solidarity Economy in the school environment for students is to offer the opportunity to obtain knowledge about this alternative economy so that, when they enter the world of work, they have knowledge of an economy different from the capitalist one, which can provide them with another alternative for generating work and income.

It is concluded, in general, that the education proposed for students from the perspective of the Telessala methodology and contemplating the teaching of Solidarity Economy, provides the conclusion of Basic Education and, in addition, an alternative for insertion in the world of work.

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Physical and chemical characterization of soil for use in ecological bricks

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Maria de Lourdes Xavier de França Neta Alves[1], Sâmea Valensca Alves Barros[2] and Fabrícia Nascimento de Oliveira[3]

ABSTRACT

The use of natural resources in the manufacture of materials to meet the demands of the Architecture, Engineering and Construction (AEC) industry must occur according to the regulations established for each type of material. One of the determining factors for the use of soil in the production of ecological bricks is to know its physical properties. In this context, the physical and chemical characterization of the soil is extremely important because it allows to verify the technical feasibility of its physical parameters for such use. This work aims to characterize the soil collected in the municipality of Itaiçaba/CE and to identify if it meets the specifications of ABNT NBR 10833 to be used in the production of soil-cement bricks. The physical and chemical characterization was carried out using the following techniques: particle size analysis by sieving; Atterberg limits; determination of optimal humidity; maximum dry specific weight and chemical composition by X-ray fluorescence (XRF). The results indicated that the soil meets the technical specifications required for use in ecological bricks, presenting in its chemical composition the presence of phyllosilicate minerals, which allow it to be characterized as clay soil. In addition, its reddish color occurs due to the iron oxide content found in its chemical composition.

Keywords: Soil-cement, Characteristic coloration, Mediumly plastic.

[1] Master's Degree in Construction Materials and Processes
Doctor Student at the Federal University of Paraíba (UFPB), João Pessoa/PB, Brazil
E-mail: maria_xavieer@hotmail.com
ORCID: https://orcid.org/0000-0002-4736-857X
[2] Post-Doctorate in Materials Sciences and Engineering
Federal Rural University of the Semi-Arid (UFERSA), Mossoró/RN, Brazil
E-mail: sameavalensca@ufersa.edu.br
ORCID: https://orcid.org/0000-0002-9035-486X
[3] Doctor in Plant Science/Agronomy
Federal Rural University of the Semi-Arid (UFERSA), Mossoró/RN, Brazil
E-mail: fabricia@ufersa.edu.br
ORCID: https://orcid.org/0000-0002-0333-0035

INTRODUCTION

The goals established by the Sustainable Development Goals (SDGs) of the United Nations (UN) intend to make the production of the various production chains sustainable (OLIVEIRA; BARROS, 2022). In this perspective, Rodrigues and Holanda (2015) highlight the importance of soil-cement bricks as alternative materials to meet the demand of the Architecture, Engineering and Construction (AEC) industry as they dispense with the burning process, avoiding the release of polluting gases.

In addition, they can function as a method of proper disposal of some solid waste that can be processed and inserted into cementitious matrices. Milani and Freire (2006) highlight the possibility of incorporating solid waste in the trace used in the production of soil-cement bricks. A fact that makes these products more eco-efficient and sustainable.

Danso *et al.* (2015) state that in recent decades the production process of materials to meet the demand of the civil construction industry began to use "raw earth" due to some construction techniques having adopted sustainable measures, such as the use of ecological bricks in housing. These are known, too, as soil-cement brick, compressed earth block- BTC and modular brick.

In this context, it is important to know the soil characterization techniques to verify if a certain type of soil is suitable for making soil-cement bricks, according to parameters that ABNT NBR 10833 (2013) recommends.

The present research aimed to carry out the chemical and physical characterization of soil from Itaiçaba/CE to identify if it can be used in the production of soil-cement bricks. Contributing to the popularization of soil characterization techniques for use in eco-sustainable products and, consequently, the Sustainable Development Goals that advocate ensuring sustainable consumption and production patterns.

THEORETICAL FRAMEWORK

SOIL-CEMENT BRICKS IN DWELLINGS

Silva *et al.* (2018) state that soil-cement bricks are products that have come to be used in some homes because they provide better thermal comfort to them. Meanwhile, *Motta et al.* (2014) already highlight the economic viability of using these bricks when compared to conventional bricks and the environmental footprint for not using burning.

The advantages of soil-cement bricks in relation to conventional bricks (ceramic bricks) that make them be used in the construction of houses are: easy sustainable soil obtainment; possibility of being made with a self-fitting format (simplifies the placement of bricks and avoids waste), and the masonry raised with soil-cement bricks has reduced mortar consumption because it does not require plaster or other coatings (EUPHROSINO *et al.* , 2022).

Another positive aspect of soil-cement bricks is the possibility of being made with the addition of processed/processed solid waste (ANGELO; SIMÕES, 2023). Oliveira and Barros (2024) found that when mesquite and cashew ash residues are processed and used in powder granulometry in partial replacement of the soil they can promote the *Filler effect* in the mixture and promote strength gains, they used concomitantly with Expanded Perlite as a Supplementary Cementitious Material to Portland Cement (OLIVEIRA; BARROS, 2022).

In order to achieve these advantages with the use of these bricks, their production must occur in accordance with the specifications of the standard that brings the technical aspects to be followed in relation to the soil. And when their environmental efficiency is sought through the addition of processed waste, an investigation of their characteristics after processing through characterization techniques must be carried out to ensure the good performance of the bricks.

PHYSICAL CHARACTERISTICS THAT THE SOIL MUST PRESENT TO BE USED IN SOIL-CEMENT BRICK

The soil to be used in the production of soil-cement bricks, according to ABNT NBR 10833 (2013), cannot contain organic matter in quantity that impairs the hydration of the cement and present the physical characteristics listed in Table 1. Regarding the presence of organic matter in the visual tactile identification of the soil at the time of collection, it was already verified that this presence did not occur.

Table 1: Physical characteristics that the soil must present for soil-cement

Parameters	**Values**
4.8 mm	100 %
0.075 mm	10% to 50%
Liquidate Limit	≤ to 45%;
Plasticity Index	≤ to 18%.

Source: ABNT NBR 10833 (2013)

Table 1 shows that the use of the soil for this specific purpose is conditioned to reach the percentages established for each parameter, because the soil-cement bricks, according to Souza (2006), correspond to a homogeneous and proportional mixture of soil, cement and water, which is compacted to the optimal moisture content of the soil used, under the maximum density in hydraulic or manual presses. presenting a parallelepiped shape and can be solid or hollow.

When the soil does not meet the values stipulated by the standard, it compromises the quality of the bricks, as it will not provide the occurrence of hydration reactions between the silicates and aluminates present in the cement, which gives it greater mechanical resistance (MILANI; FREIRE, 2006).

Soil granulometry, combined with curing conditions, are factors that influence the quality of soil-cement bricks (FERREIRA *et al*., 2003; CANCIAN, 2013). Mainly, because soil is the main material that presents the highest percentage in the mixture of bricks, directly influencing the quality and final cost of the product (PECORIELLO; BARROS, 2004).

MATERIALS AND METHODS

MATERIALS

The materials used in this research were: Portland Cement CP V ARI MAX (National, Brazilian Society of Portland Cement), soil collected in the municipality of Itaiçaba/CE and drinking water, supplied by the local company, CAERN (Water and Sewage Company of Rio Grande do Norte), for the supply system of Angicos/RN.

After collection, the soil was air-dried, disaggregated, quartered and sieved in an ABNT nº 4 sieve (4.8 mm). To perform the chemical characterization, the soil was sieved in an ABNT mesh sieve No. 200 (0.0074mm).

METHODS

Chemical characterization of the soil

The chemical composition was determined by X-ray fluorescence spectrometry (XRF), this technique is based on the principle of the absorption of X-rays by the material that causes the internal ionization of atoms, generating a characteristic radiation known as "fluorescence". Meanwhile, the chemical analysis was carried out through X-ray fluorescence spectrometry (EDX), with EDS detector (Shimadzu EDX 720) to obtain the oxides present in the composition of the samples.

Determination of the physical parameters of the soil to verify the feasibility of its use in soil-cement bricks

The soil consistency limits were determined according to the methodologies proposed by the ABNT NBR 6459 (2016) and NBR 7180 (2016) standards. Meanwhile, the compaction test was carried out according to the procedure proposed by the ABNT NBR 7182 (2016) standard and the granulometric analysis took place by screening, according to the ABNT NBR 7181 (2016) standard.

RESULTS

CHEMICAL CHARACTERIZATION OF THE SOIL

Table 2 presents the chemical composition of the soil of Itaiçaba/CE that was used in this research.

Table 2: Chemical composition of the soil

Determinations (%)	Soil
SiO_2	56,16
K_2O	2,57
Al_2O_3	34,45
Fe_2O_3	4,77
MgO	1,10
Oxides	0,95

Source: Authors (2024)

The results obtained (Table 2) show that the studied soil has a high content of aluminum oxide (34.45%), which may be an indication of the presence of phyllosilicate minerals (kaolinite, vermiculite, chlorite, mica, among others), which are characteristic minerals of clay soils.

It is worth mentioning that the reddish color presented by the studied soil is justified by the presence of iron oxide content (4.77%) present in its chemical composition. Another specific characteristic of clay soils.

PHYSICAL CHARACTERIZATION OF THE SOIL

Table 3 shows the Atterberg limits and the fraction that passes through the ABNT No. 200 sieve that were determined for the soil studied.

Table 3: Atterberg Limits of Soil

Determinations (%)	SOIL	Limits NBR 10833 (2013)
Liquidate Limit (LL)	22,75	≤ to 45%
Plasticity Limit (LP)	19,69	-
Plasticity Index (PI)	8,06	≤ to 18%
Passing through the ABNT Nº 200 sieve	32,86	10% to 50%

Source: Authors (2024).

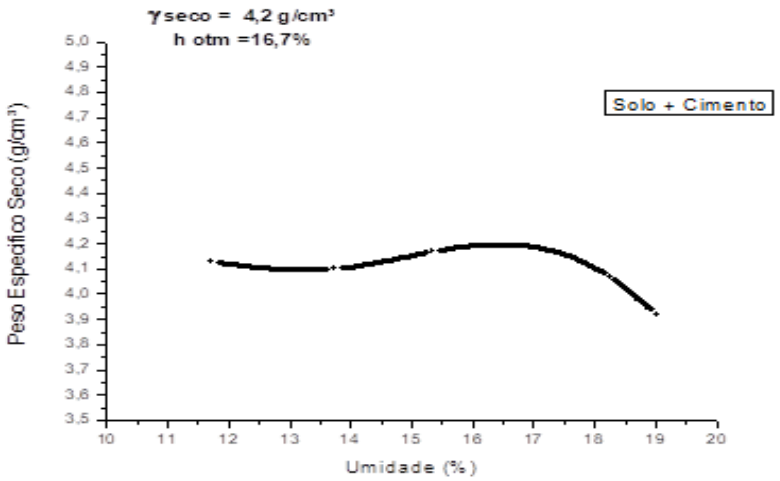
The results (Table 3) show that the liquidity limit (27.75%) and the plasticity index (8.06%) obtained meet the requirements of ABNT NBR 10833 (2013). The value of the PI achieved by the soil classifies it, according to Caputo's (2013) methodology, as moderately plastic (because it falls into the range $7 < IP < 15$) and this average plasticity confers a better workability to the mixture at the time of making the soil-cement bricks. Corroborating with the results of the chemical characterization, allowing it to be classified as clay soil.

The criterion of granulometry regarding the fraction of the soil passing through the ABNT No. 200 sieve was also achieved, and as highlighted by Ferreira et al. (2003) and Cancian (2013), granulometry is extremely important for the quality of the bricks, as these in terms of proportion present in the mixture are the largest constituent.

Therefore, the values obtained for the parameters established by ABNT NBR 10833 (2013) indicate that the studied soil can be used in the manufacture of soil-cement bricks.

Figure 1 shows the compaction curve obtained for the soil with 10% cement.

Figure 3: Soil compaction curve



Source: Authors (2024).

Through the image of Figure 1, it can be seen that the maximum dry specific weight was 4.2 g/cm³ and optimum moisture was 16.7%. These values are important when making soil-cement bricks to obtain the ideal amount of water and ensure good compaction in a hydraulic or manual press of ecological bricks.

FINAL CONSIDERATIONS

From the results obtained in this work, it is concluded that the soil has average plasticity, a fact that corroborates the chemical composition obtained allowing to classify the soil as clayey. In addition, it meets all the parameters established by ABNT NBR 10833 (2013), so it can be stated that the soil collected in the municipality of Itaiçaba/CE is indicated to be used in the manufacture of soil-cement bricks.

Regarding sustainable consumption and production proposed by the goals established by the Sustainable Development Goals, this research corroborates the popularization of the SDGs, demonstrating that good practices by companies that operate in the manufacture of construction materials are achieved when investing in research capable of demonstrating sustainable alternative materials of quality according to normative specifications using material characterization techniques.

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The resounding of the drums of the Military-Civil Dictatorship in Brazil: The tortures, the persecutions against Dom Hélder Câmara and the murder of Father Henrique

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Élcia de Torres Bandeira[1]

ABSTRACT

Nothing seems more absurd than the resounding resounding cries of pain in the face of the war arsenal that is often used as a silencer of the facts and contrary arguments that are raised in the sense of awareness and social mobilization for the well-being of all indiscriminately on the banks of the Ipiranga, the Capibaribe, the Beberibe or even the Jordan River. Remembering and repudiating the tortures, the murder of Father Henrique and the attacks and persecutions against Dom Hélder Câmara in Recife is necessary for understanding popular religiosity in Brazil and the tortuous paths that the Catholic Church took during the military-civil dictatorship in the country. Under the hallucinatory rhythm of the military's drumming, human bodies became drums emitting out-of-tune sounds. The impunity of crimes and the symbolic representations associated with them demand reflection and denunciation. Silence also becomes a crime due to the inertia of complicity. History and Justice are responsible for ascertaining the facts.

Keywords: Tortures, D. Hélder, Fr. Henry.

[1] Master in History
UFRPE
RECIFE-PE
LATTES: http://lattes.cnpq.br/4669638328828195

INTRODUCTION

When it comes to the struggle for the banner of human rights, voices echoed in silence during the long years of political repression between 1964 and 1985. From the crowd of faithful Catholics in Recife, two clerics stood up: Dom Hélder Câmara and Father Henrique, waving as a sign of peace and harmony among the men of ill will who claimed to represent law and order in the country. Law imposed by force of arms and order maintained at the cost of spilled blood. Blood that Christ had taught not to shed; concrete lessons of solidarity and love fought and banished by the human misery that is configured over the centuries in different social spaces and political times, but marked by the same adverse reaction of those who did not sow and did not reap the seeds left by Christ.

Nothing seems more absurd than the resounding resounding cries of pain in the face of the war arsenal that is often used as a silencer of the facts and counter-arguments that arise in the sense of awareness and social mobilization for the well-being of all, indistinctly, on the banks of the Ipiranga, the Capibaribe, the Beberibe or even the Jordan River. Remembering and repudiating the practices of torture, the murder of Father Henrique and the attacks and persecutions against Dom Hélder Câmara is necessary for the understanding of popular religiosity in Brazil and the tortuous paths that the Catholic Church took during the military-civil dictatorship in the country.

THE STORY

It was the year 1964 in Brazil. The crisis of the populist model had become clearly evident during the João Goulart government; the President, politically isolated by the right, outraged by the advance of social participation in the country, whose representatives feared for private property, especially threatened by the advance of mobilizations and social struggles throughout Brazil that were already reaching the countryside, finally declared his support for popular demands and ratified the articulation of the opponents of the government that promoted the coup of 1964.

The political climate had made the government unsustainable, which, even though supported by the left, no longer had the strength to resist the coup articulated quietly, behind the scenes, involving many of the main actors in this play that the majority of the Brazilian population did not get to see; It was staged only for those chosen by the right, worthy of trust to sustain the farce of democracy after the military-civilian coup of 1964. The marginal line had been established in the configuration favorable to the basic reforms that President João Goulart had assumed at the beginning of the presidential phase of his term and had emphatically made public at the Central do Brasil rally on March 13 of that year.

The intended reforms affected the city and the countryside. Agrarian reform moved rural workers, especially in the Northeast, heir greatly to the inheritance of the monoculture latifundium and the land expropriation underlying the remaining agro-export economic model. The peasant

leagues demanded efficient and immediate government action to guarantee access to land, which raised the old controversy about rights and usufructs in the country. This theme, addressed in the progressive wings of the Catholic Church, often articulated clergy and the low-income population in a web of ideals and social struggles of the most diverse political currents. Although the Church, as an institution, at its highest levels, supported the deposition of João Goulart, certain groups within it projected the expansion of popular participation and defended political openness, engaging in one way or another in the resistance to the military regime.

Bishops, such as Dom Hélder Câmara, were already standing out in the struggle for human rights and social justice, commitments assumed by the Second Vatican Council. under suspicion was Dom Hélder and his assistants such as Fr. Antonio Henrique Pereira da Silva Neto throughout the military-civilian dictatorship in Brazil.

DOM HÉLDER CÂMARA

Ceará was the birthplace of Hélder Pessoa Câmara on February 7, 1909 in the city of Fortaleza. His life, from an early age, was permeated by the social misfortunes that affected even his family: of his twelve siblings, five died of diphtheria in twenty-nine days (CIRANO, 2004, p.6). Son of bookkeeper and journalist João Eduardo Torres Câmara Filho and teacher Adelaide Rodrigues Fonseca, these tragic events, since his childhood, may have contributed greatly to bring him closer to the social problems experienced by the low-income population of the Northeast. Hunger, drought, diseases and lack of medical care were just some of the indicators of the lack of effective action by the governments that succeeded each other in the country without establishing a public commitment to social welfare.

When he was ordained a priest, his religious and political trajectories were just beginning. Throughout his life, he went through Integralism and held several political positions such as the position equivalent, today, to that of Secretary of Education in Ceará in the government of Francisco Menezes Pimentel in 1934. Years later, he considered his passage through Integralism as a sin of youth, to which he refers by saying:

> I was ordained at the age of 22, in 1931. Shortly thereafter, Plínio Salgado began to write for a newspaper in São Paulo, called *Ação*. In Ceará, we read those articles with a certain avidity. I owe a lot to my seminary. I owe a lot, but for that very reason I feel free to say that, from a social point of view, I left poorly equipped. The social aspect was not the strong point of my masters. So much so that our vision was that the world would be increasingly divided between right and left, between capitalism and communism. So, when the Brazilian Integralist Action emerged, which was, in fact, Brazilian fascism, I was so convinced that the world would really go for this clash, for this division, that I consulted my bishop, when I was invited to join the movement. The Archbishop of Fortaleza thought it would be interesting and opportune for you to enter, because, he said, at least you will be with the young people, with the workers, and if it takes too wrong a turn, you will leave, with the people. (Interview with Jornal do Brasil, RJ, 24/04/1977 apud CIRANO, 2004, p.8).

In 1936, he took up the position of technical assistant at the Department of Education of the Federal District, then located in Rio de Janeiro, when he abandoned Integralism. He was auxiliary bishop in Rio de Janeiro, where he dedicated himself to the protection of the less favored, which would mark his pastoral work throughout Brazil.

In addition to being the creator of the National Conference of Bishops of Brazil (CNBB), he was its secretary general from 1952 to 1964, secretary of social action (1964/1968) and president of the migration commission. In 1955, CELAM – General Conference of the Latin American Episcopate was created, participating in it as delegate of Brazil and vice-president in 1958/60 and 1964.

Due to disagreements with the archbishop of Rio de Janeiro, Dom Jaime de Barros Câmara, he ended up taking over the archdiocese of Olinda and Recife in 1964, a few days before the coup, which he would lead until he retired in 1985. His work has been recognized worldwide in favor of human rights and social justice, and he has been nominated to receive the Nobel Peace Prize. He personified one of the most active leaders of the progressive wing of the Church: he was barbarously persecuted and repressed, suffered bomb attacks and his assistant, Father Antônio Henrique Pereira da Silva Neto, was cruelly murdered under torture during the military-civil dictatorship in Brazil.

FATHER ANTÔNIO HENRIQUE PEREIRA DA SILVA NETO AND THE TORTURES OF THE DICTATORSHIP

The sound of the screams for the opening was silenced. Under the hallucinatory rhythm of the military's drumming, human bodies became drums emitting out-of-tune sounds. If only the public could at least hear them... The deafening sounds of the disciplinary cries of the military mob overlapped with the protests, the cries of family members and the cries of poignant pain of those torn apart by the weapons of the dictatorship. The electricity of the shocks generated unbearable psychological traumas for the survivors and led the drums to fall profoundly silent in the rhythm of the funeral march, accompanied by military marches and the marches of the reaction of those who protested and filled the streets, before Institutional Act number 5 took away the little freedom that still remained.

There was a priest in Recife. His name was inscribed in the book of the dead, not that book of the dead of the ancient Egyptians, but that of those killed by the military regime in Brazil: Antônio Henrique Pereira da Silva Neto. It was added only to the anonymous dead and to those who enjoyed, in the afterlife, some identity. The latter were collected as human remains or recognized as accidents along the tortuous course of the river of violence that spread like a plague through the country. Like many, he had walked the path of no return of those tortured and cruelly murdered by the military in the exercise of the excesses of the abuse of arbitration, an arbitrariness that not everyone could have.

Both should obey ritualistically in a perpetual position of reverence for the owners of power; others received the reverences of those who voluntarily bowed or forced the curvature of so many others who insisted on not bowing, like that toy – the stubborn doll that, no matter how much it is pushed to the ground, always rises back to the starting position. I remember this toy in the distant days of my childhood... But childhood has passed and the innocence of the early years has been stolen. Life is not a toy! It is the most important thing you can have to at least be able to fight to achieve the happiness that only exists where there is love and freedom.

Atrei O Pau No Gat To To
But the cat to I'm not dead reu reu
Dona Chica ca ca was admired if it was
From the scream, from the scream the cat gave...
(Cantiga de roda, unknown author, undated).

Parallel to the innocence of children who played in their childhood in the 1960s and 1970s, the maturity of young people and adults sometimes transformed innocent games, such as the game of marbles, into weapons of defense against the military and cavalry in the marches of protests and demonstrations in favor of democracy, when demonstrators against the 1964 coup threw marbles to the ground to knock down horses and marbles. knights and free themselves from persecution, beatings, arrests and torture in the police stations and in the underworld of the basements of the DOI-CODI. The marbles were seized as evidence and weapons used in the alleged crime of attack on the current social order. "In general, each family locks itself in its apartment and makes no point of getting to know the neighbors and maintaining a relationship with them... Children and young people are the ones who often meet, get to know each other, play together..." (CÂMARA, apud CENDHEC, Cidade sem Violência newspaper, July 2009, p. 1)

Sock, Marbles
There's a boy
There's a kid
Always living in my heart
Every time the adult swings
He comes to give me his hand

There's a past in my present
A very hot sun in my backyard
Every time the witch haunts me
The boy gives me his hand

And tell me about beautiful things
That I believe
That will not cease to exist
Friendship, word, respect
Character, kindness, joy and love
'Cause I can't
I must not
I don't want to
Living like all these people

Insists on living
And I can't take it quietly
Any bullshit is normal

Sock ball, marble
The solidary does not want loneliness
Every time sadness catches up with me
The boy gives me his hand

There's a boy
There's a kid
Always living in my heart
Every time the adult falters
He comes to give me his hand
(NASCIMENTO; BRANT, 1995)

But the years passed... And childhood is gone, bringing the maturity of the historian who insists on not silently bowing to the excesses that crossed my childhood and adolescence from the age of three to twenty-four. And I see myself today as a blind witness to the events that I only became aware of years later. Today, as a professor of History at the Federal Rural University of Pernambuco, I analyze with astonishment the symbols of the dictatorship: a body torn apart under torture found in a thicket of the University City. One priest, one life. Father Henrique, advisor to Dom Hélder Câmara, has died...

In the early hours of May 26, 1969, Father Antonio Henrique Pereira da Silva Neto was kidnapped and killed under violent torture. There is evidence of the participation of the CCC (Communist Hunting Command), but those responsible remain unpunished. Rogério Matos do Nascimento, an economics student at the time, was arrested as the only suspect on June 20, 1969 and later released in 1973. He pleaded not guilty and later began to accuse agent Henrique Pereira, a civil police officer of the Public Security Secretariat, known as X-9 and recognized for being one of the torturers of the military regime, and Raimundo Ferreira, who later became renowned as Major Ferreira.[2] The crime was associated with drug users to detach it from the category of political crime. He was 28 years old and worked as a leader of the Youth Ministry and worked at Juventato Dom Vital, which was machine-gunned as a form of threat and intimidation.

> His body was found, the next day, in a thicket in the University City of Recife, hanging upside down, from a tree, with evident marks of torture: beatings, cigarette burns, deep cuts all over his body, castration and two deep wounds produced by firearms. (ARAÚJO et al, 1995, p.56).

[2] See master's dissertation presented in the Graduate Program in History of UFPE de CUNHA, Diego Antonio Carneiro da. State of exception, Catholic Church and repression: the murder of Father Henrique Pereira da Silva Neto. Dissertation of History UFPE, 2007 Available at: https://attena.ufpe.br/bitstream/123456789/7465/1/arquivo3388_1.pdf, p. 144.

The body - proof of the incontestable crime. This body they did not want to hide. It was to be seen. The planned traumatic shock to students and clergy would also signal red for the general population. Red of the sign that stops traffic and orders the end of the movement; red of the blood that had flowed freely, without scruples or limits. There were no limits for some. There should be for others. The body, which would also symbolize the body of resistance to the excesses of the dictatorship. The body of the individual historical subject that represented the body of the collective historical subject that should also be stopped at the red light of the green field... A field where very close to it stood a *university campus* frequented by restless, inconvenient, reluctant students and the greens after the 1964 coup. Between the reds and the greens there could be the yellows... Yellow for the worms of the hinterland or the agreste in the peasant leagues or in the urban leagues in which the unhealthiness of the precarious housing generated yellowing; all the alloys under the yellow sun of energy or lack of it. This could come from the shocks of the pepper or even the yellow of the flag, remembered in those glorious moments of hoisting, which should represent greens, yellows, blues, reds, in short, the entire constellation of colors and stars of Brazil. Or it could even represent those who "yellowed" under the weight of repression and remained silent out of fear when the drums were silenced.

> March, soldier.
> Paper head.
> Whoever does not march properly,
> Go get pro quartel.
> (Cantiga de roda, unknown author, undated).

The march continued at the pace. The "paper heads" continued marching as the military band continued to tune the out-of-tune. Those who did not march the right march could certainly go to the barracks...

> The barracks caught fire,
> The police gave the signal,
> Acode, acode, acode
> The national flag.
> (Cantiga de roda, unknown author, undated).

Those who tried to raise the flag sometimes also fired fire at the barracks or even at the greens, without also paying attention to the signs of peace and care for the danger that the smoke inspired... Attacks, bank robberies, kidnappings were used by the extreme left as guerrilla strategies to confront the dictatorship. Several left-wing organizations joined the armed struggle. There was no way to remember, in the midst of the shouts and guns firing, the nods of peace and love of Christ, Dom Hélder Câmara or even Fr. Henrique or even the Indians, our ancestors, who used smoke as a means of communication. Violence was understood, dialogue was not. They were different languages

in a great Tower of Babel. And the historian, like Torres Bandeira, tried to understand the multiple languages spoken, written or even silenced in these Towers of Babel. But, like the twin towers of the *World Trade Center*, it plummeted into the void of the explosions and still tries to raise the flag of peace and love among men and women of ill will.

> Walking
> Walking and singing and following the song
> We are all equal, arm in arm or not.
> In schools, on the streets, in fields, in buildings,
> Walking and singing and following the song.
> (VANDRÉ, 1968).

The year 1968 exploded, which, according to Zuenir Ventura (1988), did not end. Several strings were pulled in the streets expressing the multiple wills towards the end of the dictatorship. However, the cordon of isolation and hanging, represented by Institutional Act Number 5, silenced the population and separated the coup plotters from democracy, creating a stronger link with violence and with the line of torture that separated the living from the dead. Some who survived physical torture did not survive for long the psychological torture that reproduces itself mentally, even when the mechanisms and instruments that originated it cease, as happened with tortured people who, even though they were later exiled, ended up seeking relief in suicide. The final silence. They would no longer hear the resounding of the screams, the insults, they would not remember the endless pain and suffering they had to endure under the drumming of the military-civilian dictatorship in Brazil. This is what happened to Friar Tito.

> It is important to remember that the sequelae left are not restricted only to the political dead and disappeared; they are countless, and they are also found in the category of the soul-mutilated, those in whom the action of the "sovereign power" has left deep scars. Especially of a psychological nature, more difficult to cure. They belong to the domain of unforgettable and dark marks, insofar as they accompany their victims inexorably, as if permanently reminding them that sovereign power acts, penetrates, disciplines, molds and imprisons body and soul, producing effects, affecting not only political prisoners, but also their families. (SILVA, 2014, p. 291)

The tortures against clerics, who were accused of covering for Marighela, are remembered with regret. The disrespect for the cassock and its meaning for Catholics far lost to the disrespect for human beings materialized there in friars dedicated to the defense of human rights. According to Percival de Souza, the friars Tito de Alencar Lima, João Antônio Caldas Valença and Giorgio Calegari were subjected, after their arrest, to intense interrogation and torture sessions. Mocking Catholic rituals, police chief Raul Pudim Ferreira, better known as Pudim, opened the interrogation dressed in a Dominican cassock, saying:

> -Dear brothers, now you are going to confess with me...
> The verb *to confess*, pronounced with unsubtle irony, had a second meaning. Not to confess to obtain forgiveness for the sins committed, but to confess everything to the inquisitor of the Dops. [...]
> -Dear brothers, remembering the baptism of the Lord in the waters of the Jordan, let us renew the promises of our baptism, by which we have already renounced Satan and his works, and promised to serve God and the Catholic Church. (SOUZA, 2000, p.213)

After sprinkling water as in a profane purification ritual and having fun with his preparatory staging, he called the policemen who were going to proceed to the next stage, "leaving the psychological phase for what the policemen sadistically called *pauligraph* (a way of extracting confessions through torture, on the *stick*), he handed over to their care those "black sheep", diverted from the flock". (SOUZA, 2000, p. 215).

Arrested in 1968, accused of renting the Ibiúna site to the Congress of the National Union of Students (UNE), Friar Tito was arrested again in 1969 with other friars accused of maintaining links with the National Liberation Alliance (ALN) and Carlos Marighela.

> Friar Tito was tortured for 40 days by the team of delegate Sérgio Fleury. He was later transferred to the Tiradentes prison, where he remained until December 17. On that day he was taken to the headquarters of Operation Bandeirantes (DOI-CODI/SP), when Captain Maurício Lopes Lima told him: "now you are going to know the branch of hell". And that's what happened. Tortured for two days, hanging from the pau-de-arara, receiving electric shocks to the head, genitals, feet, hands, ears, with punches, clubs, "telephones", paddles, "Polish corridor", "dragon chair", burns with cigarettes, all accompanied by threats and insults. At one point, Captain Albernaz ordered him to open his mouth to receive the sacred host, introducing an electric wire that burned his mouth to the point of preventing him from speaking. (ARAÚJO et al., 1995, p. 250).

Baptism of blood was the usual procedure. Information should be extracted even from those who did not have it to give. If the information sought had not been extracted, the teeth, nails, hair, and certainly human dignity could have already been pulled out in the inhumane interrogations for which US agents were teachers in the technique of extortion of information. Brazil learned the lesson so well that it began to export the torture merchandise in the form of training to Central America.

> Father Francisco joined the circle
> Playing his guitar.
> Your delegate comes from there
> That father Francisco got out of prison.
>
> As it has been shaking,
> It looks like a gangly doll.
> As it has been shaking,
> It looks like a gangly doll.
> (Cantiga de roda, unknown author, undated).

How many "fathers Francisco" entered and managed to get out of prisons during the military-civilian dictatorship in Brazil? How many have not taken with them the tears of the body broken by the blows, the mistreatment, the sequelae as a legacy of a historical period marked by violence and

abuse? How many delegates have not abused the power conferred on them by their office and the law to disrespect human rights like Fleury and Pudim?

> (...) That there were countless times when he was thrown into a cubicle that they called a "refrigerator" that had the following characteristics: its door was of the refrigerator type, measuring about 2 meters by one and a half meters; its walls were all painted black, with a barred opening connected to a cold air system; that, on the ceiling of this room, there was a very strong lamp; that, when the door was closed, they turned on producers of noises whose sound varied from the noise of an airplane turbine to a shrill factory siren; (...) (Gildásio Westin Cosenza, 28 years old, radiotechnician, Rio; qualification report and interrogation, 1975: BNM 684, V. 39a, p.24 to 33 apud Archdiocese of São Paulo, 1985, p.38).

The use and abuse of sounds and music rocked from childhood dreams to nightmares of torture in the "refrigerator" or in Nazi concentration camps, when Jews and other victims of social exclusion were forced to play classical music while family, friends and other convicts were tortured in the gas chambers, to hide the extermination activities promoted in the final solution applied by Hitler's followers. While the international commissions were deceived by the false culture worshipped there in the extermination camps, the gas chambers functioned freely, without any interdiction. And there are still those who insist on trying to hide the massacre of thousands of people who are victims of totalitarian regimes as happened in Brazil!

> The pawn entered the circle, the pawn
> The pawn entered the circle, the pawn
> Pawn wheel, bamboo pawn.
> Pawn wheel, bamboo pawn.
> (Cantiga de roda, unknown author, undated).

Circle games, so innocent for children, were also codified as torture techniques. Why Father Francisco's connection with the guitar, the roda, the police chief and the prison? Surveillance of popular culture has always been referenced in Brazil in different spaces and times; The guitar and play were synonymous with idleness, and idleness was associated with the danger of parties, drinks, and the disorder of the civilizing model of a society disciplined by work within the interests of the elites and established power relations. These samba circles or simple singing could go on all night and disturb the silence and public order of the workers or even generate explosions of contained joy during the moments of work, when idleness and leisure approached to generate a festive atmosphere within lives often lived in a bitter way, far from these fleeting moments that police repression insisted on mutilating.

> Viana's agents were ruthless and truculent. The most famous of them was Major Miguel Nunes Vidigal. Second commander of the new Royal Guard, Vidigal became the terror of Rio's trickery. He would lurk on street corners or suddenly appear in capoeira circles or in the drums in which slaves fraternized drinking cachaça until late at night. Regardless of any legal procedure, he ordered his soldiers to arrest and beat up any delinquent or just an ordinary citizen who was having fun. (GOMES, 2008, p. 234)

Scenes like this, which could be witnessed in the streets of Rio de Janeiro in the nineteenth century, point to the historical roots of authoritarian procedures in Brazil regarding leisure and samba or capoeira circles.

> These methods that allow for the meticulous control of the operations of the body, that carry out the constant subjection of its forces and impose on them a relationship of docility and utility, are what we can call the "disciplines". Many disciplinary processes had existed for a long time: in convents, in armies, in workshops as well. But the disciplines became, in the course of the seventeenth and eighteenth centuries, general formulas of domination. (FOUCAULT, 1987, p. 118).

It is thus evident that such initiatives did not constitute innovations to maintain the "social order" and guarantee the interests of the elites who felt threatened. It is interesting to articulate with the limits imposed on citizenship transposed to the twentieth century, when torture on the citizen became a strategy of investigation and social control under the batuque of the military. Although, in general, the suppression of public spectacles of torture is perceived, as Foucault points out, the punitive ceremonial became an administrative act, and could be performed in a private place (1987. p. 12). However, these practices of subordination and control over the body and mind of the citizen were not always hidden from the general population, as exemplified by the case of Father Henrique in Recife. They exposed the mutilated body in order to establish a sign to stop the resistance movement of so many men and women who, like him and Dom Hélder Câmara, reacted to the arbitrary decisions of the military regime, although the ritual of torture was carried out quietly, in the dead of night, so that there would be no witnesses to denounce the explicit violence underlying the established model of social control.

> Song of the Three Races
>
> And it echoes night and day:
> You are the winner.
> Oh, what agony,
> The worker's song.
>
> That corner that should
> Be a song of joy
> It just sounds like sobbing in pain.
> (PINHEIRO; DUARTE, 1976).

Marcília Gama da Silva points out the relevance of the Department of Political and Social Order of Pernambuco in the repression and social control through torture in Pernambuco:

> The labyrinths of fear and terror, censorship and repression, personified in the actions of persecution, home invasion, imputation of slander, threats, intimidation, denunciation, blackmail, arrests, kidnappings, punishments and all sorts of violations/immolations developed in the torture rooms and outside them are part of the sad period experienced by Brazilian society. [...] The Department of Political and Social Order of Pernambuco was a

> fundamental part of the information and security network during the military regime, being considered by political prisoners as the workshop of terror. (SILVA, 2914, p. 290)

The torturers of the military-civilian dictatorship in Brazil were extremely creative in associating the circle game with torture. Entering the circle could mean anything from beating to gang rape and injuries from sharp piercing instruments when the suspect was turned and pushed from one investigator to another, usually stripped naked to ensure his or her humiliation and stripping of self-love. In many songs, from the period of the military-civil dictatorship, the codification of the "rose" or "rosebush", which can represent rape, and the red of the blood, the roses, are used. "Defloration" itself is a terminology that has long been used to designate rape.

> To find the appropriate punishment for a crime is to find the disadvantage whose idea is such as to render the idea of a crime definitively unattractive. It is an art of energies that fight each other, art of images that are associated, the fabrication of stable connections that defy time. It is important to constitute pairs of representation of opposite values, to establish quantitative differences between the forces in question, to establish a set of signals-obstacles that can subject the movement of forces to a power relationship. (FOUCAULT, 1987, p. 87).

First, it should be noted that the representations about the conceptualization of what is a crime and the relative sanctions imposed have historically existed within temporal and spatial frameworks. Defending human rights became a crime during the military-civilian dictatorship in Brazil. Dom Hélder himself suffered assassination attempts and death threats; not being able to reach him without tarnishing the image of the complex machinery of power, since he was an internationally recognized citizen, the main target became his assistant, Fr. Henry. Thus, they hit both at the same time.

These power relations required consensus on the part of managers and a good portion of the population. According to Bourdieu (2000, p.7-8), "symbolic power is, in fact, this invisible power which can only be exercised with the complicity of those who do not want to know that they are subject to it or even that they exercise it". As necessary representations, in order to guarantee social welfare and democracy, violent interventions appeared on a daily basis, although there was no access to the body of the crime, to the evidence or simple slanders presented behind the scenes to guarantee the execution of the penalty sanctioned for the resistance groups to the military regime in Brazil. What passed to the media was filtered by censorship and those who denounced the practices of torture, or had some family, professional or even affective connection with the accused, were in the focus of suspicion as potential criminals.

In the case of Fr. Henrique, his family suffered arrests and persecutions, demonstrating the danger represented by having any trace of critical sense, of autonomy to think or act within a regime sustained by force and consolidated by the representations of consensus to the procedures applied, accepted by social segments that supported the military-civilian coup in 1964. The social body also needed to be disciplined to be docile and useful to the excesses of the military in Brazil, and for this

violence was used against the body of the individual historical subject. Thus, control over the effectiveness of the social troops, of the collective subject represented there, would be established.

> Torture puts pressure on confession and triumphs in all its functionality when it subdues the victim. This is the virtuous hyperbole of the torturer. It resembles the surgical act, extracting from the victim something malignant that he would not expel without aggression. (GASPARI, 2002, p. 38)

However, the former minister of the military government, retired Colonel Jarbas Passarinho, in an interview given to Jornal do Commercio and published on March 31, 2004, when asked if there were excesses in the methods used by the military to ensure order, states:

> In the middle of the Medici government, I answered a question on TV if there was torture in Brazil. He said yes, but that it was not a matter of government policy, but of personal deformations. (PASSARINHO, 2004, p. 6)

Also in the same interview, asked about his opinion at the meeting of December 13, 1968 called by President Costa e Silva, he declared:

> At the meeting of the Security Council – which included the ministers – President Costa e Silva, after listening to Vice President Pedro Aleixo, who was in favor of the decree of a state of siege, asked for our votes. I praised the vice-president's pronouncement, but voted for AI-5, saying: "Your Excellency, Mr. President, like me, is repugnant to take the path of dictatorship, but if I have no alternative, to my scruples of conscience." Before the meeting, the Minister of Justice said that the state of siege did not solve what the military ministers were asking for, because it maintained the habeas corpus. (PASSARINHO, 2004, p. 6)

This authoritarian posture comes back to haunt Brazil in the Bolsonaro government in the 21st century, exposing the fragility of the rule of law that we managed to build after the military-civilian dictatorship in Brazil that exposed our wounds between 1964 and 1985. Far-right movements such as the movement of the 300 threaten to reap human rights and the harmony and independence of the three powers that, according to the illuminist Montesquieu, should sustain the state. There is a hypertrophy of the Federal Executive that seeks to override and threatens to close the Legislative and Judiciary powers, especially, configuring frequent attacks on the Federal Supreme Court. The then president of the republic and some of his representatives in the ministerial sphere are unaware of the democratic parameters already established by the 1988 Constitution that former President Jair Bolsonaro publicly committed to defend at his inauguration. Political disagreements between the federal, state and municipal spheres appeared as symptoms of a serious illness that hit the Brazilian state in times of the pandemic of the new coronavirus, also called Covid-19, because it was diagnosed at the end of 2019.

Reflecting on the societies of the Ancien Régime, when expressions of absolutism linked to the monarchical form of government are found, Chartier (2002, p. 75) clarifies:

> The relationship of representation is thus blurred by the fragility of the imagination, which makes one take the deception for the truth, which considers the visible signs as sure indications of a reality that does not exist. Thus diverted, representation becomes a machine for manufacturing respect and submission, an instrument that produces an internalized imposition, necessary where the possible recourse to brute force is lacking.

Foucault (2006, p.14) analyzing the order of discourse states that:

> Certainly, if we place ourselves at the level of a proposition, within a discourse, the separation between the true and the false is neither arbitrary, nor modifiable, nor institutional, nor violent. But if we situate ourselves on another scale, if we raise the question of what has been, what is constantly, through our discourses, this will to truth which has traversed so many centuries of our history, or what is, in its very general form, the kind of separation which governs our will to know, then it is perhaps something like a system of exclusion (historical system, institutionally embarrassing) that we see taking shape.

Daring to make a bridge between absolutist regimes in monarchical states and dictatorial regimes in republican states, the appropriation of these representations, manipulated by the mechanisms of power in force, allows us to verify the timelessness of authoritarian procedures of governments that are established in the name of the majority, but neglect their own real bases of social support, attending to principles of force and representations imposed to guarantee the acquired power.

Media propaganda has become a fourth branch that is often used to spread so-called "fake news", fake news that emerges in judicial proceedings as tools for cybercrime. Forming public opinion seems quick and easy through the internet and the media channels it provides. Breaking spaces and times through remote activities seems to fulfill us from the point of view of sociability and communication mediated by the "web". Technology deconstructs borders and creates social networks that can provide relevant services. However, misinforming the population with slander, unreasonable aggression and fallacious news result in crimes that must be punished by the rigors of the law. The awareness of being Brazilian demands respect for differences and responsible attitudes that guarantee democracy and solidarity with a view to social well-being.

Burke (1992, p. 24), embarking on the arduous mission of explaining the weaving of the new writing of History, observed that:

> Seen from within, everyday life seems eternal. The challenge for the social historian is to show how it is in fact part of history, to relate daily life to major events, such as the Reformation or the French Revolution, or to long-term trends, such as Westernization or the rise of capitalism.

Analyzing the historiographical production on the 1964 Coup, Carlos Fico points out crucial problems that were reflected in the articulation and implementation of the dictatorship in Brazil:

> The structural transformations of Brazilian capitalism, the institutional fragility of the country, the uncertainties that marked the government of João Goulart, the political propaganda of Ipes, the coup nature of the conspirators, especially the military – all are causes, macrostructural or micrological, that must be taken into account, and there is no theoretical fragility in considering as reasons for the coup both the structural conditions and the conjunctural processes or the episodes Immediate. May such a conjunction of adverse factors - we all hope - never be repeated. (FICO, 2004, p.56)

This system of exclusion, configured in Brazil in the constraining form of a military-civilian dictatorship between 1964 and 1985, broke the limits of citizenship and human rights by creating its own norms of conduct, imposed as legitimate, and made the drums of denunciation resound when the secret archives began to be opened and the path of redemocratization was sought again. This is a process that is still under construction in the power relations that emerge in the daily life of the twenty-first century. The impunity of crimes and the symbolic representations associated with them demand reflection and denunciation. Silence also becomes a crime due to the inertia of complicity. History and Justice are responsible for ascertaining the facts.

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Chia (Salvia hispanica L.): Chemical composition, phenolic compounds, antioxidant activity, and antitumor activity

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Daisy Naomi Tan[1], Marcelo Alexandre Prado[2] and Sheila Oliveira-Alves[3]

ABSTRACT

The intake of bioactive compounds, such as phenolic compounds and omega 3 fatty acids, from foods of animal and plant origin, is important for protection against chronic non-communicable diseases, such as cardiovascular disease, diabetes, cancer, among others. The increase in cancer incidence is related to changes in eating habits, exposure to pollutants, and factors such as consumption of foods with simple sugars and saturated fats. Studies show that the consumption of natural antioxidants present in fruits, vegetables and vegetable oils can reduce the risk of cancer and other chronic diseases. Chia seed, rich in phenolic compounds and α-linolenic fatty acid, has been linked to benefits such as reducing cardiovascular disease, controlling diabetes, and protecting against oxidative stress. Research on chia seeds seeks to understand its health benefits and its potential in preventing diseases related to metabolic imbalance and chronic inflammation, including cancer.

Keywords: Chia (Salvia hispanica L.), Antioxidante, Antitumoral.

[1] Graduated in Food Engineering
Institution: State University of Campinas (UNICAMP)
E-mail: dnaomi20@gmail.com
[2] Doctor in Food Science
Institution: State University of Campinas (UNICAMP)
E-mail: mprado@unicamp.br
[3] Doctor in Food Science
Institution: National Institute of Agrarian and Veterinary Research (INIAV)
E-mail: sheilacris.oliveira.alves@gmail.com

INTRODUCTION

CHIA

Salvia hispanica L. is a biannually cultivated herbaceous plant, belonging to the family Lamiaceae, superdivision of Spermatophyta, and Kingdom Plantae (Mohd Ali et al., 2012). Salvia hispanica L., popularly known as chia, is native to southern Mexico and northern Guatemala, being an important staple food cultivated in the Pre-Columbian period, as the ancient Aztecs and other cultural groups in Mesoamerica cultivated and harvested chia seeds extensively, and its use in cooking occurred in the form of whole grains and crushed (Cahill, 2003).

The chia plant can grow up to 1 meter tall, has opposite arranged leaves, with its flowers being purple or white, with a size between 3 to 4 mm, and the fused parts of the flower contribute to a high rate of self-pollination (Mohd Ali et al., 2012). The color of the seed varies between black, gray and black mottled with white, and its shape is oval, with length ranging from 1.90 to 2.37 mm and diameter from 1.21 to 1.43 mm (Ixtaina et al., 2008), as shown in Figure 1.

Figure 1. Planting chia (a) and chia seed (b). (Source: Tosco 2004; Coelho & Salas-Mellado, 2014).



Currently, chia is cultivated in Argentina, Colombia, Ecuador, Peru, Bolivia, Paraguay and Australia, for commercial purposes of its seeds (Coates & Ayerza, 1996; Busilacchi et al., 2013). Seeds soaked in water, fruit juice, and soups are the most consumed form in the regions of Mexico (Cahill, 2003; Reyes-Caudillo, 2008). In Brazil, chia has been consumed along with breakfast cereals, fruits, yogurts and refreshing drinks such as fruit juices and smoothies.

Chia seeds are a pseudocereal, gluten-free, and therefore have been incorporated into various types of foods, beverages and mixed flour formulations for the bakery industry. In addition, the seeds have been used as nutritional supplements as well as in the manufacture of breakfast cereal bars and biscuits in the United States, Latin America, and Australia (Coelho & Salas-Mellado, 2014).

Chia seeds have about 25.0 to 35.0 g of oil/100 g, and the fatty acids present in its oil are highly unsaturated. Essential fatty acids are the main components in chia oil, linoleic acid (LA, C18:2ω-6, 17.0-20.3 g/100 g oil) and α-linolenic acid (ALA, C18:3ω-3; 60.2-67.8 g/100 g oil),

according to Coates & Ayerza (1996), Álvarez-Chávez et al. (2008), Peiretti & Gai (2009), Ixtaina et al. (2011), Marineli et al. (2014), and Boidora et al. (2017).

The nutritional quality of chia seeds is directly related to its maturation stage, because with increasing maturity, there are reductions in the levels of fatty acids, especially α-linolenic acid, and in the crude protein content (Peiretti & Gai, 2009). Maturity, in fact, is the most important factor affecting seed quality, due to the difference in proportion between plant tissue components, increased lignification during seed development, and increased fiber fractions in plant tissues (Morrison, 1980; Wilson et al., 1991; Peiretti & Gai, 2009).

The crude protein content in the seed varies from 15.95 to 26.03 g/100 g (Ayerza & Coates, 2011; Ayerza, 2013; Marineli et al., 2014), and its content is higher than in other traditional cereal crops, such as wheat (11.00 g/100 g), maize (8.80 g/100 g), rice (13.30 g/100 g), oats (14.92 g/100 g), barley (19.04 g/100 g) and sorghum (12.10 g/100 g) (Ragaee et al., 2006; Rupollo et al. 2006). Although chia is not commercially cultivated as a source of protein, its amino acid profile is balanced, and no limiting factors are observed for an adult's diet, as the seed has considerable levels of threonine (5.91 mg/g), lysine (7.65 mg/g) and leucine (9.75 mg/g), and high levels of arginine (16.34 mg/g). asparagine (13.28 mg/g), and glutamine (25.95 mg/g), as reported by Ayerza (2013).

In addition to proteins, chia seeds have 90 to 94 g/100 g of dry matter, which is composed of carbohydrates (26-41 g/100 g), dietary fiber (18-38 g/100 g), ashes (4-5 g/100 g), minerals and vitamins, according to Mohd Ali et al. (2012) and Marineli et al. (2014). In addition to the nutrients present, when the chia seed is humidified, a mucilaginous transparent gel is formed that remains firmly attached to it, as in its epicarp there are cells that produce mucilage when moistened (Ixtaina et al., 2008). The mucilage formed is a natural exudate, composed mainly of xylose, glucose, and glucuronic acid, forming a branched polysaccharide of high molecular weight (Lin et al., 1994, Muñoz et al., 2012).

Reyes-Caudillo et al. (2008) reported that chia seeds contain about 5 to 6 % mucilage, while Muñoz et al. (2012) cited 7 % mucilage. Coorey et al. (2014) analyzed the mucilage formed in the chia seed, and reported that it has 58% crude fiber and 34% carbohydrates. The mucilage extracted from chia seeds has great potential in food formulations as a thickening agent, emulsifying agent and as a stabilizer.

The dietary fiber content in the seed varies from 18 to 38 g/100 g, with most of this content represented by insoluble dietary fiber (14-35 g/100 g), and the rest by soluble dietary fiber (2.4-3.6 g/100 g). Dietary fiber includes cellulose, hemicellulose, lignin, pectins, gums, mucilage, and other associated polysaccharides and oligosaccharides, and are resistant to digestion and absorption in the human small intestine and complete or partial fermentation in the large intestine (Esposito et al., 2005; Capitani et al., 2012). Soluble fibers are fermented in the colon, while insoluble fibers have an

action in the formation of fecal bolus and have limited fermentation in the colon (Anderson et al., 2009).

In addition, dietary fibers play an essential role in the gut health, nutritional and physiological effects of consumers, as they are significantly associated with a lower risk of developing coronary heart disease, hypertension, diabetes, and obesity (Willem van der Kamp et al., 2010).

CHIA PRODUCTS

Chia oil can be obtained by different methods, such as solvent extraction, pressing and supercritical extraction (Martínez et al., 2012). In the industry, the oil is obtained by cold pressing of the chia seed by expeller process, to obtain an oil with quality and nutritional parameters, according to the values determined by the Codex Alimentarius legislation, however cold pressing results in a partial extraction of the oil (Ixtaina et al., 2010).

The acidity index and the peroxide index are described as reference parameters to determine the quality of the conservation of the oils. According to the quality standard for vegetable oils, the legislation determines a maximum value of 3.30 g oleic acid/100 g oil and 20 mEqO2/kg oil, respectively (Codex Alimentarius, 2003). Ixtaina et al. (2012) reported the value of 1.30 oleic acid/100 g oil for the acid value and 1.00 mEqO2/kg oil for the peroxide index in commercial chia oil obtained by the cold pressing system, a method currently used for the extraction of commercialized chia oil.

The commercialization of chia oil has been growing annually due to its high content of polyunsaturated fatty acids (PUFA). PUFA play an important role in the prevention of chronic diseases, such as hypertension, coronary artery disease, diabetes, and cancer (Poudyal et al., 2012).

PUFAs vary in chia oil in the range of 80.60 to 84.09 g/100 g, and the main fatty acids identified are linoleic and α-linolenic (Álvarez-Chávez et al., 2008; Ixtaina et al., 2011; Marineli et al., 2014; Bodoira et al., 2017). Chia oil can present high variation in the content of polyunsaturated fatty acids, and these differences are attributed to different environmental conditions, such as temperature, light, soil type and available nutrients. Ayerza (1995) reported variations in the concentrations of oleic, linoleic and linolenic acid in the oil due to the location of the seed cultivation, while Ayerza & Coates (2004) reported that chia seeds grown in different ecosystems of South America showed significant differences in oil contents and fatty acid composition. Generally, the content of α-linolenic acid varies in the range of 60.20 to 67.80 g/100 g, as described by Coates & Ayerza (1996); Álvarez-Chávez et al. (2008); Peiretti & Gai (2009); Ixtaina et al., (2011); Marineli et al. (2014) and Boidora et al. (2017).

In addition, edible oils have phytosterols, which have been widely studied for their hypocholesterolemic and anticarcinogenic effects (Pelletier et al., 1995; Phillips et al., 2002;

Kozłowska et al, 2016). Generally, sterols are mainly in free and esterified form, and free sterols can have different physiological effects (Miettinen & Gylling, 1999; Phillips et al., 2002). In chia oil, the total sterol content is between 8.15 and 12.60 g/kg oil, and these levels are similar to evening primrose oil (Oenothera biennis), in which the total sterol content is approximately 10 g/kg oil, but in other unrefined oils, such as olive oil, peanut, rapeseed, safflower, sesame and sunflower, the total sterol content ranges from 1.50 to 8.00 g/kg oil (Álvarez-Chávez et al., 2008). In chia oil, β-sitosterol (7.96 g/kg) is the main component in relation to stigmastanol (1.78 g/kg) and stigmasterol (2.17 g/kg), in general, β-sitosterol represents about 60% of the total sterols in crude vegetable oils (Álvarez-Chávez et al., 2008).

Vegetable oils are major sources of tocopherols, which are natural antioxidants and play important roles in the reproduction and antioxidant mechanisms of animal and plant tissues (Guinazi et al., 2009). Chia oil has a total tocopherol content between 443 and 480 mg/kg, with γ-tocopherol being the most abundant, in the range of 415 to 463 mg/kg (Ciftci et al., 2012; Ixtaina et al., 2012; 2015).

After the extraction of the chia oil by cold welding, the fraction of the residual seed is dried, crushed at 435 μm, thus obtaining the fibrous chia flour. Therefore, flour is the residue of the process of extracting oil from the chia seed. Fibrous flour has a high protein content (32.0-35.0 g/100 g) and crude fibre (21.0-29.0 g/100 g), and considerable lipid content (8.7-14.0 g/100 g), even after processing (Capitani et al., 2012; Segura-Campos et al., 2013; Coorey et al., 2014).

According to Capitani et al. (2012), the levels of dietary fiber in fibrous flour range from 44 to 46 g/100 g, with most of this content represented by insoluble dietary fiber (40-41 g/100 g) and the rest by soluble dietary fiber (4-5 g/100 g). Insoluble fibers contribute to increased fecal bolus volume, reduced intestinal transit time, delayed glucose absorption, and starch hydrolysis. High consumption of soluble dietary fiber reduces postprandial glucose responses after carbohydrate-rich meals, as well as lowering LDL (Low Density Lipoprotein) and total cholesterol levels (Weickert & Pfeiffer, 2008).

In addition, Capitani et al. (2012) report that fibrous chia flour has a high capacity to retain and absorb water, and can be used as an emulsifying agent and stabilizer of emulsions.

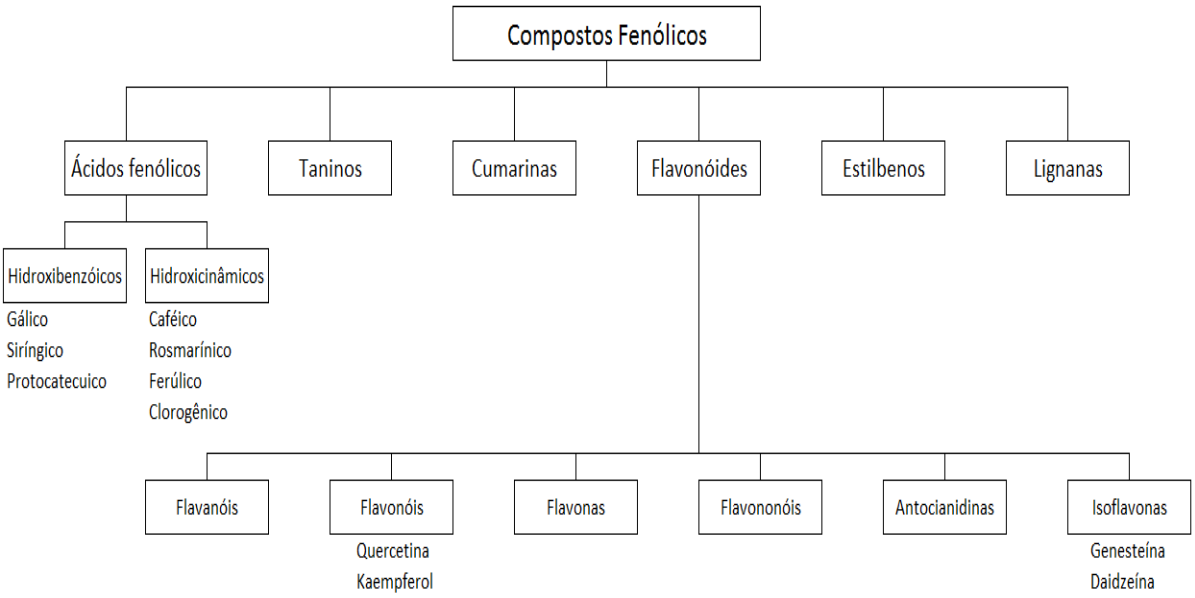
Fibrous flour is a source of minerals, with high levels of calcium (5615.0 mg/kg), magnesium (4624.0 mg/kg), iron (117.7 mg/kg) and phosphorus (9988.5 mg/kg), but low levels of copper (18.7 mg/kg) and zinc (96.0 mg/kg), as described by Capitani et al. (2012). Fibrous chia flour has been used as a raw material in cereal bar production due to its high protein and mineral contents.

PHENOLIC COMPOUNDS

Phenolic compounds are secondary metabolites present in plants and range from simple molecules to others with a high degree of polymerization, and may be present in free form, linked to sugars (glycoside) and proteins in various parts of plants (Acosta-Estrada et al., 2014; Heleno et al., 2015). Phenolics are characterized by the presence of one or more aromatic rings attached to at least one hydroxyl radical and/or other substitutes, and can be divided according to the number of phenolic rings and the structures to which they are attached (D'Archivio et al., 2007; Oliveira & Bastos, 2011).

In addition, phenolic compounds play an important role in plants in growth and reproduction, act as antipathogenic agents and also contribute to plant pigmentation. In foods, phenolic compounds can contribute to bitterness, astringency, color, flavor, aroma, and oxidative stability (Naczk & Shahidi, 2006). Among the more than five thousand phenolics described, flavonoids, coumarins, tannins, lignans, stilbenes, and phenolic acids stand out, as they have antioxidant activity (Shahidi & Ambigaipalan, 2015), as shown in Figure 2.

Figure 2. Classification of phenolic compounds. (Adapted from Shahidi & Ambigaipalan, 2015).



The most abundant groups of phenolic compounds in food are flavonoids, phenolic acids, and lignans. (D'Archivio et al., 2007; Oliveira & Bastos, 2011). Phenolic acids and flavonoids usually occur in conjugated soluble (glycoside) and insoluble forms (Nardini & Ghiselli, 2004; Acosta-Estrada et al., 2014). In nature, phenolic acids occur mainly in insoluble or bound forms, while flavonoids are presented as glycosides, with a single or multiple sugar moieties linked through an OH group (O-glycoside) or through carbon-carbon bonds (C-glycoside).

Phenolic acids are present in almost all plant-derived foods, representing a significant portion of the human diet. The average intake of phenolic acids in humans has been reported to be on the order of 200 mg/day, depending on dietary habits and preferences (Clifford & Scalbert, 2000).

The bioavailability of phenolic acids is crucial for their biological properties (Heleno et al., 2015). When ingested in free form, phenolic acids are rapidly absorbed by the small intestine and subsequently conjugated, however, the chemical structures of the compounds can also influence conjugation reactions, as well as the amount of metabolites formed by the gut microbiota in the colon (Scalbert & Williamson, 2000; Heleno et al., 2015).

After ingestion and absorption, phenolic acids are conjugated by methylation, sulfation, and glucuronidation reactions, which are controlled by specific enzymes that catalyze these steps, and conjugation reactions vary according to the nature of the phenolic acid and the amount ingested (Heleno et al., 2015).

Several factors alter the bioavailability of phenolic acids present in foods, such as the complexity of the food matrix, the chemical form of the compound, intestinal transit time, gastric emptying, compound metabolism and degree of conjugation, possible interactions with proteins in the bloodstream and tissues, composition of the gut microbiota, and the genetic profile of the individual (Crozier et al., 2009; Oliveira & Bastos, 2011)

The analysis methodology used to determine the free and bound forms of phenolic acids generally consists of extraction with aqueous organic solvents to obtain soluble phenolics, followed by a hydrolysis treatment to obtain bound phenolic compounds. Generally, ultrasound-assisted hydrolysis associated with acid hydrolysis has been used to leachate and hydrolyze phenolic compounds more rapidly than traditional methods, since the surface contact area between the solid and liquid phases is increased by particle rupture (Herrera & Luque de Castro, 2004).

In the separation, identification and quantification of phenolic compounds, advanced techniques are used, such as High Performance Liquid Chromatography (HPLC). This technique is the most commonly used, coupled to detectors such as diode array (DAD), fluorescence or mass spectrometer (MS). The use of HPLC is a tool that helps the most varied studies, as it separates compounds present in a matrix, which can be compared to standards for their identification and quantification.

The main class of phenolic compounds identified in chia seeds, using high-performance liquid chromatography analysis, were phenolic acids, which can be divided into two main groups, hydroxybenzoic and hydroxycinnamic acids, which are synthesized from the shikimic acid pathway (D'Archivio et al., 2007; Oliveira & Bastos, 2011).

Martínez-Cruz et al. (2014) analyzed chia seed by ultra-high performance liquid chromatography coupled to diode array detector (UHPLC-DAD), and the main compounds

quantified were rosmarinic acid (0.92 mg/g seed), protocatechuic ethyl ester acid (0.74 mg/g seed), caffeic acid (0.02 mg/g seed), gallic acid (0.01 mg/g seed) and daidzein (0.006 mg/g seed).

Reyes-Caudillo et al. (2008) identified chlorogenic acid (0.10 mg/g seed) and caffeic acid (0.06 mg/g seed) in chia seeds, while quercetin (0.26 mg/g seed) and kaempferol (0.50 mg/g seed) were identified in the hydrolyzed extracts by high-performance liquid chromatography coupled to the diode array detector (HPLC-DAD).

Chlorogenic acid, caffeic acid, quercetin, myricetin and kaempferol have also been identified in fibrous flour and chia oil (Capitani et al., 2012; Ixtaina et al., 2012). Phenolic compounds, especially phenolic acids and flavonoids, have been widely studied due to their various health benefits as antioxidants, in the prevention of chronic inflammation, cardiovascular disease, cancer, and diabetes.

The high diversity of phenolic acids isolated from Salvia plants has shown excellent antimicrobial activity, as well as antioxidant activity, some of which have been used against numerous pathological disorders, such as atherosclerosis and brain dysfunction (Cvetkovikj et al., 2013; Martínez-Cruz & Paredes-López, 2014).

ANTIOXIDANT ACTIVITY

Oilseeds are sources of phenolic compounds with high antioxidant activity, which can sequester free radicals. Among the phenolic compounds are phenolic acids, flavonoids, quinones, coumarins, lignans, stilbenes, tannins, vitamins, terpenoids, and some other endogenous metabolites (Cai et al., 2004; Naczk & Shahidi, 2006).

Phenolic antioxidants interfere with the oxidative process as free radical deactivators and also as metal chelators. The antioxidant potential of phenolic compounds depends on the number and arrangement of hydroxyl groups in the molecule (Cao et al., 1997). Therefore, phenolics have been widely studied, as they have diverse bioactivities that are beneficial to human health, reducing the risk of cancer, heart disease, and diabetes; as well as exerting anti-bacterial, antiviral, anti-inflammatory and anti-allergic activities (Yao et al., 2004; Oak et al., 2005; Shahidi & Ambigaipalan, 2015).

According to Bianchi and Antunes (1999), antioxidants are free radical acceptors, intercepting these compounds generated by cellular metabolism or exogenous sources, avoiding the formation of lesions, the loss of cellular integrity; and reconstituting already damaged cell membranes.

The antioxidant activity in seeds can be determined by a variety of assays with different mechanisms, including hydrogen atom transfer (HAT), electron transfer (ET), metal reduction power, and metal chelation. The FRAP (Antioxidant Power of Iron Reduction) assay is a method that

measures the power of reducing metals, i.e., it measures the ability of antioxidants to reduce the ferric ion complex (Fe3+) to the ferrous complex (Fe2+) of intense blue color in an acidic medium (Shahidi & Zhong, 2015).

The ORAC (Oxygen Radical Reduction Capacity) assay is a method based on the transfer of hydrogen atoms, and measures the ability of an antioxidant against the peroxyl radical, where the antioxidant and a fluorescent marker (fluorescein) compete kinetically for peroxyl radicals, generated through the decomposition of nitrogenous compounds, such as AAPH (2,2'-azobis-(2-methylpropionamidine)-dihydrochlorinated) at 37 °C (Ou et al., 2013). ORAC is an important in vitro assay to evaluate antioxidant activity, as it uses a biologically relevant free radical (peroxyl radical), which is prevalent in human biology. This method considers both the time of inhibition and the degree of inhibition of the release of free radical action caused by antioxidants (Ou et al., 2013, Prior, 2015).

Jiménez et al. (2010) evaluated the antioxidant activity of the oil and the whole chia seed, and the oil showed low values of antioxidant activity compared to that of the whole seed. The antioxidant activity of chia seed was obtained in the range of 45.5 to 98.73 µmol TE/g while that of the oil was from 1.32 to 4.58 µmol TE/g, indicating that the antioxidant content in chia seed is hydrophilic in nature.

Marineli et al. (2014) determined the antioxidant activity of chia seeds, obtaining a value of 514.30 µmol TE/g for the ORAC assay, and a value of 405.71 µmol TE/g for the FRAP assay. Likewise, the antioxidant activity of fibrous flour was 577.2 µmol TE/g, which is higher than that found in wheat bran, sorghum and barley (48.5, 51.7 and 14.9 µmol TE/g), according to Ragaee et al. (2006).

Phenolic acids, the majority class of phenolic compounds in chia seeds, behave as antioxidants, due to the reactivity of their phenolic fraction, i.e. the presence of hydroxyl in the aromatic ring. Although there are several mechanisms, the predominant mode of phenolic acids' antioxidant activity is thought to be the deactivation of radicals via hydrogen atom donation (Shahidi & Ambigaipalan, 2015). Therefore, chia seeds are considered as functional ingredients with high antioxidant potential in food products with commercial applications.

ANTITUMOR ACTIVITY

Currently, cancer is among the leading causes of death in the world, and is defined as the set of diseases in which abnormal cells can divide and grow disorderly, being able to invade other tissues, and can spread throughout the body through the circulatory system establishing itself in other organs and tissues (NCI, 2017).

Studies report that the increase in the incidence of cancer may be related to changes in eating habits, increased life expectancy, increased pollutants and contact with carcinogenic compounds, whether due to these factors or others, this pathology is today one of the biggest public health problems (Monteiro et al., 2014; Siegel et al. 2016; Wang et al., 2016).

Investigators report that oxidative stress is one of the key components in linking environmental toxicity to the carcinogenic process, as reactive oxygen species (ROS) are generated in response to both endogenous and exogenous stimuli (Ziech et al., 2010; Fuchs-Tarlovsky et al., 2013). Evidence, both in vivo and in vitro studies, points to environmental agents, such as radiation, xenobiotics and chlorinated compounds, as significant inducers of cellular damage via ROS-mediated toxicity (Klaunig & Kamendilus, 2004; Garis et al., 2008; Fuchs-Tarlovsky et al., 2013). Studies have described the relationship between increased oxygen reactive cell radicals and the pathogenesis of several chronic diseases, including cancer (Shobha & Andallu, 2013; Prasad et al., 2016).

ROS are constantly generated within the body and are necessary to drive regulatory pathways, but they are also one of the causes of several pathological conditions, including cancer. Numerous lines of evidence suggest that ROS can promote as well as suppress cancer cell survival. ROS are known to regulate every step of tumor development, including transformation, survival, proliferation, invasion, metastasis, and angiogenesis (Prasad et al., 2016).

Studies report that ROS can mediate an indirect attack on DNA, mainly through reaction with other cellular components, such as phospholipids, resulting in the generation of reactive secondary intermediates and irreversible coupling to the DNA base, forming DNA adducts (Marnette, 2000; Fuchs-Tarlovsky et al., 2013). The formation of DNA adducts is central to the carcinogenesis process, because if such adducts escape cellular repair mechanisms and persist, they can induce errors, and ultimately, mutations (Wogan et al., 2004). Therefore, oxidative lesions have been implicated in the etiology of cancer, and lesions serve as a critical biomarker of oxidative DNA damage (Valko et al., 2004; Fuchs-Tarlovsky et al., 2013).

Evidence from experimental studies has shown that natural compounds, including phenolic compounds, act as positive anticancer regulators by adjusting the oxidative stress response, inhibiting cancer cell proliferation, and modulating autophagic signaling (Hasima & Ozpolat, 2014; Lang et al., 2015; Irimie et al., 2015; Guaman-Ortiz et al., 2017).

Studies of preclinical and clinical models have indicated that natural antioxidants promote reduced risk of cancer, and epidemiological data suggest that people who consume diets rich in natural antioxidants, which come from fruits and vegetables, have a lower risk of developing chronic disease and mortality than those who eat low amounts of fruits and vegetables (Shanmugam et al., 2016; Prasad et al., 2016; Prasad et al., 2017).

An in vivo study with a diet containing cereals and vegetables, such as "Wushen" (a mixture of foods containing 55 natural ingredients, including plants, meats, cereals and legumes), demonstrated high antitumor activity, reducing tumor growth by 48.52% in an experimental model with mice implanted subcutaneously with murine sarcoma S180 cells, and this antitumor potential of the "Wushen" diet is directly associated with its antioxidant properties (Wang et al., 2014).

Eating diets containing herbs, fruits, and vegetables significantly increases the antioxidant capacity of plasma, as the bioactive compounds present in vegetables are antioxidants, and prevent the formation of radicals, removing radicals before damage can occur, repairing oxidative damage, eliminating damaged molecules, and preventing mutations (Shobha & Andallu, 2013).

Phenolic compounds can limit the formation of initiated tumor cells by stimulating DNA repair (Yang et al., 2001). Quercetin, catechins, isoflavones, lignans, flavanones, ellagic acid and resveratrol, induce a reduction in tumor growth (Shobha & Andallu, 2013). Phenolic acids, such as gallic acid, chlorogenic acid, caffeic acid, have inhibitory properties against the invasive (adhesion, migration and angiogenesis) and metastatic behaviors of a variety of cancer cells in vitro and in vivo (Weng & Yen, 2012; Roleira et al., 2015).

Studies with polyunsaturated fatty acids (PUFA) present in vegetable oils and oilseeds have been investigated in tumor assays due to their anti-inflammatory and anticarcinogenic action. The high consumption of PUFA, specifically ω3-PUFA, can contribute to the reduction of chronic inflammatory processes involved in the development of many tumors (Vendramini-Costa & Carvalho, 2012). In addition, PUFA present in vegetable oils exert antitumor effects, perhaps affecting gene expression or activating signal transduction molecules involved in the control of cell growth, differentiation, apoptosis, angiogenesis, and metastasis (Espada et al., 2007).

Miranda-Vilela et al. (2014) evaluated the effects of supplementation with pequi oil (Caryocar brasiliense) on oxidative damage induced by doxorubicin in mice with solid Ehrlich tumor, with a protective effect on oxidative damage induced by doxorubicin and containment of tumor growth due to the high concentration of PUFA in pequi oil.

Among the models of in vivo studies to evaluate the anticancer activity, Ehrlich's tumor has been used because it is a practical and transposable murine tumor model for the analysis of the antiproliferative effects of several compounds, and this tumor can develop in the solid form, when inoculated subcutaneously, and in the ascitic form, when the cells are inoculated into the animal's peritoneum (Nascimento et al, 2006; Vendramini-Costa, 2010).

Espada et al. (2007) investigated the antitumor effects of diets with 6% chia oil and 6% safflower oil, consumed over a period of 45 days, in a model of murine mammary adenocarcionoma transplanted subcutaneously in Balb/C mice, obtaining a significant reduction of 29.68% in tumor mass and 88.89% in the number of metastases in the groups that consumed the diet with chia oil,

however, the diet with safflower oil did not significantly reduce tumor mass. The results indicate that chia oil, with a high content of ω3-PUFA, is a potential antitumor agent, and may have preventive action. Therefore, more studies should be carried out in order to prove its preventive potential and its mechanism of action.

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The relationship between quality of life and the use of immunobiologicals in patients with psoriasis

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Aline Moreira Lócio[1], Lara Maria de Oliveira Paiva[2], Lêda Maria Veloso Bastos[3] and Luciana Maria Pereira de Oliveira[4]

ABSTRACT

This study investigated the relationship between quality of life and the use of immunobiologicals in patients with psoriasis. In order to assess how these therapies affect the daily lives and well-being of patients, a cross-sectional study was conducted at the General Hospital of Fortaleza between September 2023 and June 2024, with 29 patients with psoriatic arthritis. Using a questionnaire based on the Psoriasis Life Quality Index (DLQI), two groups were compared: those who used immunobiologicals and those who did not. The results showed that, although treatment with immunobiologicals offers effective control of the disease, the impact on quality of life varied. In particular, the use of immunobiologicals was associated with a significant improvement in the ability to play sports. However, the overall psychosocial impact seemed attenuated, possibly due to the patients' long time with the disease and their familiarity with its condition. Limitations of the study include the small sample size and the difficulty of evaluating patients with active disease. It is concluded that, while immunobiological therapy can improve specific aspects of quality of life, further research is needed in future research to better understand the impact of these therapies on different stages of psoriasis and to develop more comprehensive approaches.

Keywords: Health, Skin lesions, Psoriasis.

[1] Medical Student at Unichristus
[2] Medical Student at Unichristus
[3] Medical Student at Unichristus
[4] Master's Degree in Internal Medicine, Federal University of Ceará

INTRODUCTION

On the world stage, there are several community, technological, and economic changes that impact the mental health of the population. Emotional changes, such as anxiety, stress and depression, promote behavioral and body disorders that limit the individual's daily activities, whether in the student, work or social fields. [1] The relationship between these factors and the onset of diseases has become a growing concern in recent years, highlighting the importance of investigating this problem in different contexts and populations. [2] That said, it is known that skin and brain cells are formed in the same embryonic leaflet, neuroectoderm. This allows the body, through the emotional state, to manifest this discomfort or anguish through skin lesions, as occurs in psoriasis. [3]

Psoriasis is an immune-mediated inflammatory systemic disease in which the pathophysiology is not yet well established, but it is known that there is a relationship between the immune system, genetic predisposition, and environmental factors responsible for the period of exacerbation and remission of symptoms. [4] [5] The clinical cutaneous manifestations of psoriasis are diverse, but the most common is symmetrical, erythematous, and scaly plaques in regions such as the scalp, extensor areas, nails, palms, and soles. [6] In addition, the prevalence varies among different ethnic groups, in both sexes, and manifests initially in young adults, with 75% of cases before the age of 46 years, but it can appear in childhood. [7]

Treatment of psoriatic disease should be based on its severity, extent, associated comorbidities, emotional impairment, and patient's lifestyle. [3] [8] [9] In this context, for psoriasis, the oral systemic therapy currently used consists of retinoids, methotrexate, and cyclosporine A, as well as topical agents such as corticosteroids, vitamin D analogues, calcineurin inhibitors, and keratolytics, and finally, UVB phototherapy, which can be used to control the condition. [10] It should be noted that patient management also involves screening for comorbidities, especially cardiovascular diseases, education about the disease, and detection of mood disorders. [9]

In this context, according to guidelines from the *American Academy of Dermatology-National Psoriasis Foundation*, the treatment for moderate to severe forms is immunobiologicals, due to their high efficacy and safety. [10] These drugs target the IL-23/Th17 axis and TNF-α signaling, which are essential in the development and chronicity of psoriasis. Its application occurs subcutaneously or intravenously in different weekly regimens. [11] The most commonly used biologic agents are: TNFα inhibitors *(infliximab, adalimumab, certolizumab pegol*), IL 12/23 inhibitors (*ustekinumab*), IL 23 inhibitors (*guselcumab* and *risankizumab*), and IL 17 inhibitors (*secukinumab*, *ixekizumab,* and *brodalumab*). [12] In addition, there is a high prospect for growth in the therapeutic arsenal, as a result of the constant studies for the introduction of new immunobiologicals, such as JAK inhibitors. [12]

The complexity involved in the pathophysiology and treatment of psoriasis is notorious, but an equally complex issue that is often neglected or minimized by both health professionals and the

general population is the way in which this disease affects the quality of life of its patients. It is worth mentioning that the impact generated by psoriasis manifests itself in several ways, generating physical, social, psychological, and financial damage, which vary according to the clinical severity of the disease, presence of associated comorbidities, type of treatment used and its adherence, psychosocial state, in addition to personal perceptions about the cause, chronicity, and control of the disease. [13] Recent studies have shown that the psychological impact caused by psoriasis is as harmful as the physical lesions of the disease and contributes equally to its morbidity. Due to this understanding, several ways of qualifying and quantifying the impact on quality of life caused by psoriasis have been developed, among them, the most used and validated is the quality of life index in dermatology (DLQI). [14].

In view of the above, it is concluded that psoriasis is a chronic inflammatory dermatological disease that manifests itself not only by skin lesions, but also leads to serious psychological damage to those affected. In addition, due to the minimization of the importance of the impacts generated on quality of life, despite the various treatments on the market, there is still a great difficulty in dealing with the disease in a multiprofessional way and with a support network appropriate to the needs of patients.

Thus, the main objective of the present study is to evaluate the relationship between quality of life and the therapy used in patients with psoriasis, aiming to contribute to a more comprehensive and effective approach to this chronic disease.

METHODS

The study was carried out between September 2023 and June 2024, at the General Hospital of Fortaleza (HGF), and data collection was carried out from September 2023 to January 2024. The study population consisted of patients followed up at the rheumatology outpatient clinic of the HGF followed up with psoriatic arthritis, with a sample of 29 people. The exclusion criteria were individuals who denied consent to the research and those who left the questionnaire incomplete. The study design is cross-sectional. A questionnaire was developed through the *Google Forms* platform, with single-answer questions, addressing sociodemographic data and quality of life in patients with psoriatic arthritis. Statistical analysis was performed using the Mann-Whitney U test, using the *Statistical Package for the Social Sciences (SPSS) software*. Approval for this study was obtained from the Institutional Ethics Committee.

APPROVAL OF STANDARD PROTOCOLS, REGISTRIES, AND PATIENT CONSENTS

Approval for this study was obtained from the Institutional Ethics Committee. Written informed consent was obtained from and with their consent.

PROCEDURE

All participants were asked to fill in their information about age, full name, biological sex, and use of immunobiologicals. The questionnaire (Psoriasis Life Quality Index - DLQI), containing 10 questions, about the impact of signs and symptoms on the quality of life of individuals, taking into account physical, social and emotional aspects. The questions have been translated into the local language (Portuguese).

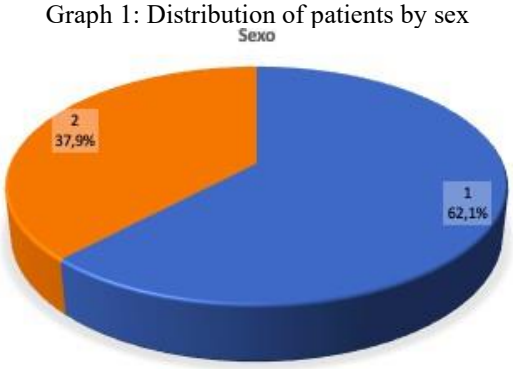
After completing the questionnaire, the individuals were divided into two groups according to their "Yes" or "No" answers to the question "Do you use immunobiologicals?". Based on this, the group that answered "Yes" and the group that answered "No" were compared with each other with the other questions about the impact of the disease on quality of life, such as embarrassment, limitations in social relationships of friendship and love life, and interference in daily activities, such as going shopping, leisure activities, and sports. work and studies.

RESULTS

SAMPLE CHARACTERISTICS

The number of patients with psoriasis who participated in the study was 29 individuals, 18 females (62.07%) and 11 males (37.93%) (Graph 1).

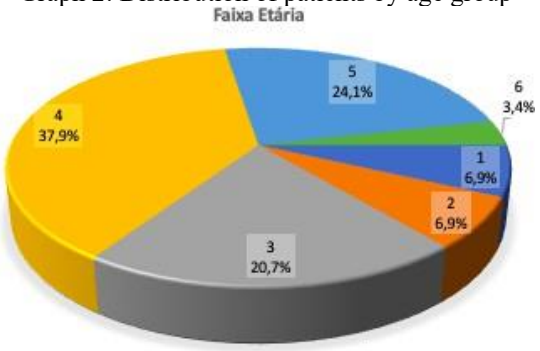
Graph 1: Distribution of patients by sex



Source: Prepared by the authors.

The predominant age group was 50-60 years, totaling 11 patients (37.93%), followed by the ages of 60-70 years with 7 (24.14%), 40-50 years with 6 (20.69%), 30-40 years with 2 (6.90%), 20-30 years with 2 (6.90%) and 70-80 years with 1 (3.45%) (Graph 2).

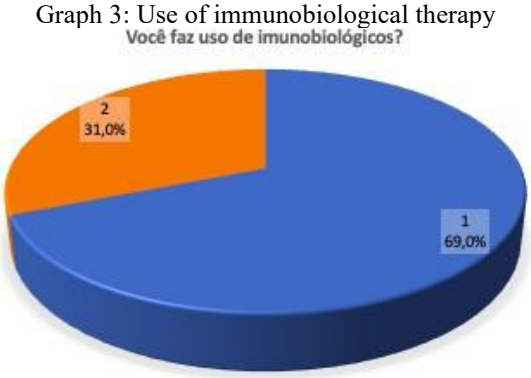
Graph 2: Distribution of patients by age group



Source: Prepared by the authors.

Regarding the use of immunobiological therapy, 20 patients (68.97%) used immunobiologicals and 11 patients (31.03%) used other medication to control psoriasis (Graph 3).

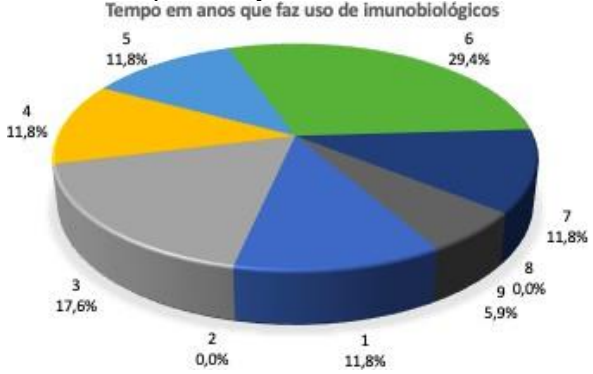
Graph 3: Use of immunobiological therapy



Source: Prepared by the authors.

Regarding the time of adherence to immunobiologicals, in years, Graph 4 shows that the patients who stand out the most in terms of time using immunobiologicals are those in the range of 5 to 10 years (29.41%), followed by those who use 2 to 3 years (17.65%); those aged 10 to 15 years; from 4 to 5 years old; from 3 to 4 years old and those under 1 year old, all with (11.76%).

Graph 4: Distribution of patients by time of adherence to immunobiologicals



Source: Prepared by the authors.

IMPACT ON QUALITY OF LIFE

The results highlight the impact of treatment, both with immunobiologicals and with the use of other medications, and addresses the influence of the disease on work, leisure activities, relationships and self-esteem, with an impact rating ranging from 0 to 3, being **3 - Really a lot**; **2 - Quite a lot**; **1 - A little**; and **0 - Nothing**. The data revealed an effective control of disease activity in all treated patients. (Table 1).

Table 1: Outcomes of the impact of therapy on quality of life

1. How much has your skin been affected during the past week because of itching, inflammation, pain, or burning?	
0 - Nothing	37,93%
1 - A little	34,48%
2 - Quite a lot	13,79%
3 - Really Very Much	13,79%
2. How much embarrassment or other type of limitation was caused by your skin during the past week?	
0 - Nothing	48,28%
1 - A little	20,69%
2 - Quite a lot	13,79%
3 - Really Very Much	17,24%
3. How much has your skin interfered with your shopping activities or outings, at home or in public places, during the past week?	
0 - Nothing	44,83%
1 - A little	37,93%
2 - Quite a lot	6,90%
3 - Really Very Much	10,34%
4. To what extent has your skin interfered in the past week with the clothes you normally wear?	
0 - Nothing	51,72%
1 - A little	27,59%
2 - Quite a lot	6,90%
3 - Really Very Much	13,79%
5. How much has your skin affected any of your social or leisure activities in the past week?	
0 - Nothing	62,07%
1 - A little	13,79%
2 - Quite a lot	10,34%
3 - Really Very Much	13,79%
6. How hard was it for you to play sports during the past week?	
0 - Nothing	58,62%
1 - A little	6,90%
2 - Quite a lot	10,34%
3 - Really Very Much	24,14%

7. Did your skin prevent you from going to work or study during the past week?	
0 - Not relevant	6,90%
1 - Yes	27,59%
2 - No	65,52%
8. How problematic has your relationship with your partner, close friends, or relatives become because of your skin?	
0 - Nothing	58,62%
1 - A little	10,34%
2 - Quite a lot	17,24%
3 - Really Very Much	13,79%
9. To what extent has your skin created difficulties in your sex life in the past week?	
0 - Nothing	79,31%
1 - A little	3,45%
2 - Quite a lot	10,34%
3 - Really Very Much	6,90%
10. To what extent has your dermatological treatment created problems for you in the past week?	
0 - Nothing	72,41%
1 - A little	13,79%
2 - Quite a lot	13,79%
3 - Really Very Much	0,00%

Source: Prepared by the authors.

The comparison between treatment with immunobiologicals and other drugs was conducted using the *Mann-Whitney U* test, as shown in Table 2. These results suggest a differentiated improvement in the ability to play sports among the treatment groups, indicating a potential benefit of the use of immunobiologicals in this specific aspect of the quality of life of patients with psoriasis.

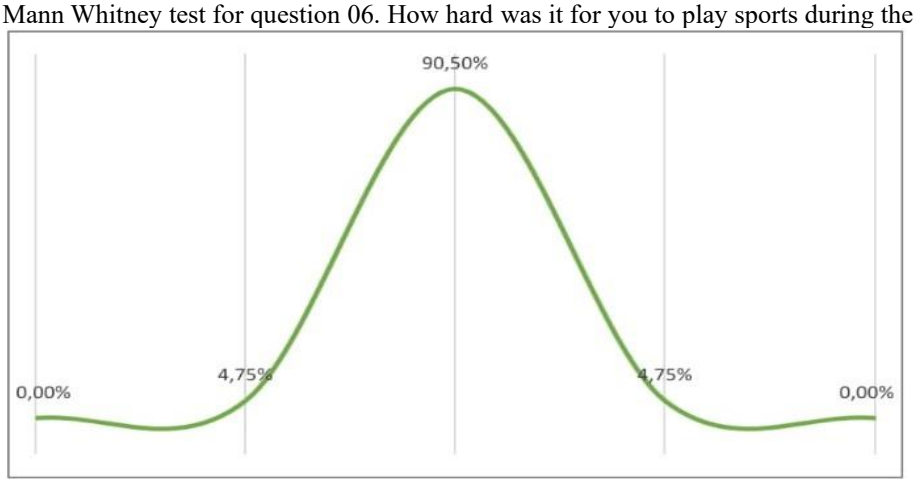
Table 2: U-Mann Whitney test for the questions

Question	Use of Immunobiologicals	Average	Standard deviation	P-value	Confidence Interval
Q1	Yes	0,95	1,00	62,70%	37,30%
	No	1,22	1,20		
Q2	Yes	0,85	1,14	31,70%	68,30%
	No	1,33	1,22		
Q3	Yes	0,70	0,80	56,20%	43,80%
	No	1,11	1,27		
Q4	Yes	0,80	1,11	72,90%	27,10%
	No	0,89	1,05		
Q5	Yes	0,60	1,05	29,50%	70,50%
	No	1,11	1,27		
Q6	**Yes**	**0,70**	**1,17**	**9,50%**	**90,50%**
	No	**1,67**	**1,41**		
Q8	Yes	0,65	1,09	15,30%	84,70%
	No	1,33	1,22		
Q9	Yes	0,20	0,62	14,00%	86,00%
	No	1,00	1,32		
Q10	Yes	0,35	0,67	66,00%	34,00%
	No	0,56	0,88		

Source: Prepared by the authors.

Just for the question "6. How difficult was it for you to play sports during the past week?" demonstrated statistical significance. For the patients who answered "Yes" regarding the use of immunobiologicals, the mean was 0.70 with a standard deviation of 1.17, while for those who answered "No" the mean was 1.67 with a standard deviation of 1.41. The "p" value obtained was 9.50%, with a confidence interval of 90.50%. Graph 5 below shows this result.

Graph 5: U Mann Whitney test for question 06. How hard was it for you to play sports during the past week?



Source: Prepared by the authors.

DISCUSSION

The main objective of this study was to determine how the use of immunobiologicals affects the quality of life of patients with psoriatic arthritis. To achieve this objective, we initially analyzed which questions indicated greater and lesser interference in the quality of life of the affected

individuals. It was observed that the question "6. How hard was it for you to play sports during the past week?" had the greatest impact on patients' quality of life, with the highest number of responses with the maximum score on the form, totaling 7 (24.14%) "3 - Really a lot" responses. In contrast, it was observed that in question "9. To what extent has your skin created difficulties in your sexual life?", was the question that was shown to affect the quality of life of patients in a milder way, with 21 (79.31%), answers corresponding to "0 - Nothing". A fact that may be related to the possible embarrassment in answering this question. In addition, other questions also stood out for the large number of answers that indicate a minimum interference in the quality of life, which are: "10.

To what extent did your dermatological treatment create problems for youpast week?", with 21 responses (72.41%) "0 - Nothing" and "5. How much has your skin affected any of your social or leisure activities in the past week?", with 18 responses (62.07%) "0 - Nothing".

The results presented in the sub-item "Impact on Quality of Life" can be partially explained by the higher prevalence of patients who are using immunobiologicals chronically, with a minimal number of patients with the disease in its active form. Therefore, the psychosocial impact related to active injuries, such as embarrassment, itching crises, inflammation, pain, and burning, as well as social relationships with friends, family, and romantic partners, tends to be lower. Another relevant factor is that patients who have lived with the disease for years already have a better understanding of their illness and consequently a better relationship with the disease, thus accepting their condition and adapting to the various impacts already suffered in the past.

Consistent results were found in studies that used other scales, such as the "*Quality of Life of Patients with Psoriasis*", which assessed the quality of life of patients with the "Psoriasis Disability Index (PDI) scale. This study revealed that patients generally enjoyed a satisfactory quality of life, highlighting the need to evaluate factors such as gender and age. [15]

Following this logic, the analysis of these characteristics of the sample was carried out with the answers obtained. According to Table 3, it was observed that females showed a greater impact on quality of life, with 20 (60.61%) answers "3 - Really a lot" and 97 (65.10%) answers "0 - Nothing", compared to the opposite sex, which obtained 13 (39.39%) answers "3 - Really a lot" and 52 (34.90%) answers "0 - Nothing". This difference may be related to the greater aesthetic social pressure suffered by women, leading to a greater psychosocial impact by exposing the lesions to the social cycle.

Table 3: Sample characteristics by Sex

Answer	Male	Female	Total
0 - Nothing	34,90%	65,10%	100,00%
1 - A little	36,73%	63,27%	100,00%
2 - Quite a lot	53,33%	46,67%	100,00%
3 - Really Very much	39,39%	60,61%	100,00%
Grand Total	37,93%	62,07%	100,00%

Source: Prepared by the authors.

According to Table 4, in relation to the age of the research participants, it was shown that patients in the age group "50 – 60 years" were the most affected, with 10 (30.30%) "3-Really Very Much" answers and 53 (35.57%) "0 - Nothing" answers. Compared to those in the age group "20 – 30 years" who were less affected, with 3 (9.09%) answers "3-Really Much" and 7 (4.70%), answers "0 - Nothing". These results may be related to the presence of comorbidities, especially arthrosis, which further affect the quality of life of such patients.

Table 4: Sample characteristics by age group

Answer	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	Total
0 - Nothing	4,70%	6,71%	18,79%	35,57%	28,19%	6,04%	100,00%
1 - A little	12,24%	8,16%	12,24%	46,94%	20,41%	0,00%	100,00%
2 - Quite a lot	6,67%	6,67%	26,67%	43,33%	16,67%	0,00%	100,00%
3 - Really Very Much	9,09%	6,06%	36,36%	30,30%	18,18%	0,00%	100,00%
Grand Total	6,90%	6,90%	20,69%	37,93%	24,14%	3,45%	100,00%

Source: Prepared by the authors.

When relating the answers obtained with the use or not of immunobiologicals using Whitney's *U Mann* method, it is observed that the question "6. How difficult was it for you to play sports during the past week?" was statistically significant, as shown in the results. The current hypothesis for the specific statistical relevance of this question in comparison with the other questions on the form is that the practice of sports activities is not only related to the psychosocial impact on the quality of life of these patients, but also to the physical impediment caused by psoriatic arthritis, which can manifest itself with joint pain, difficulty in moving the affected joint, and local swelling.

In fact, according to the systematic review article "*Psoriasis and Co-morbidity*", arthritis has a great effect on the illness of those affected, evidencing its relationship with unemployment and loss of productivity at work, a factor that enhances the impact on the quality of life of individuals, in addition to the importance of early diagnosis and treatment, which can avoid permanent deterioration of the joints[16].

LIMITING FACTORS

The study obtained results with large variables due to the sample size (N=29), a factor that makes it impossible to have a p with greater significance among the findings of the aforementioned research. In addition, future research should consider dermatological protocols other than the Psoriasis Life Quality Index (DLQI), since the form does not evaluate the influence of drug therapy such as treatment adherence, dose, and dosage within the daily life of psoriatic patients. However, according to the systematic review entitled "*Quality of Life and Body Region Affected by Psoriasis*", the most prevalent scale to assess quality of life in patients with psoriasis was the DLQI. The study highlighted the importance of using similar scales to allow a more accurate comparison between studies[17].

Another challenge of the present study is the source of research data that were based only on the patients' responses. More interviews and analysis of medical records would be necessary for greater confidence in the results found. Recall bias can erroneously provide answers to past events, so future studies should consider gold-standard sources for better analysis and conclusion of the research. In addition, when filling out the DLQI form, some patients did not respect the 2-week time interval when answering the questionnaire, giving more relevance to the impact caused on quality of life during the other years of the disease. This reflects the fact that the patients are already in the disease control phase and with prolonged use of immunobiologicals, making it impossible to analyze the psoriatic disease in the active phase and its impact on the quality of life of the interviewees.

CONCLUSION

The analysis carried out in this study on the quality of life and the use of immunobiologicals in patients with psoriasis reveals that, although there is no significant and general change in the quality of life of patients after the use of these medications, it is crucial to consider the prolonged time of living with psoriasis and the familiarity of the participants with their condition. The predominance of patients in chronic use of immunobiologicals made it difficult to assess the impact on active disease. In addition, because they have already lived with the disease for a long time, the patients' understanding and acceptance of the psoriasis condition suggest an attenuated psychosocial impact. Therefore, the need for more specific questionnaires and additional studies that address the nuances between chronic and acute disease is highlighted, aiming at a deeper understanding of the impact of immunobiological therapy in this context.

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Patient safety from the perspective of fetal alcohol syndrome: Scoping review

https://doi.org/10.56238/sevened2024.018-041

Giovana Knapik Batista[1], Paula Pontes Reis[2], Rafaella Fadel Friedla[3], Gisele Tomazinho Fumagalli[4], Camila Aparecida Moraes Marques[5] and Elaine Rossi Ribeiro[6]

ABSTRACT

OBJECTIVE: The aim of this study was to map the effect of Fetal Alcohol Syndrome with a view to patient safety. METHODOLOGY: scoping review, carried out in the Science Direct, Cochrane and CAPES Portal databases. The search resulted in 2,014 publications, of which 30 remained after the selection stages. RESULTS: The highest number of publications was in 2019, with 26.67% of the total, 40% of which were in the USA, 96% of which were in English. It can be mapped that the deficit in the diagnosis of Fetal Alcohol Syndrome and its similar, negatively affects patient safety and modifies social behavior. The complex and heterogeneous nature of the maternal profile and context, culture and historical-social legacy were identified, as they are related to the etiology and epidemiology of the spectrum. CONCLUSIONS: the effective implementation of the various screening and diagnostic tools was listed as urgent, as early childhood is a predictor of a better holistic development of the individual, which minimizes any losses related to the syndrome and patient safety.

Keywords: Fetal Alcohol Spectrum Disorders, Developmental Disabilities, High-Risk Pregnancy, Fetal Alcohol Syndrome, Patient Safety.

[1] Academics of the medical course at Faculdades Pequeno Príncipe
[2] Academics of the medical course at Faculdades Pequeno Príncipe
[3] Master's degree, professor of the medical course at Faculdades Pequeno Príncipe
[4] Master's Degree from the Teaching Program in Health Sciences at Faculdades Pequeno Príncipe
[5] Doctor, research professor of the Health Sciences Teaching Program at Pequeno Príncipe Colleges
[6] Doctor, research professor of the Health Sciences Teaching Program at Pequeno Príncipe Colleges

INTRODUCTION

Linked to gestational alcohol consumption, there are deleterious effects on the embryo and fetus associated with intrauterine exposure to alcohol. For Mesquita (2009), these effects are grouped into the spectrum of fetal alcohol disorders (FASD), which are represented by physical, mental, behavioral and learning impairment. These changes can be perpetuated throughout the individual's life, who may have a high chance of becoming addicted to alcohol and other drugs, cognitive, school and work difficulties, inappropriate sexual behavior and even legal complications.

In FASD, the most severe condition is configured by Fetal Alcohol Syndrome (FAS), which includes facial changes, pre- and/or postnatal growth restriction, and structural and/or functional abnormalities of the central nervous system (CNS). Even though the clinical presentation of intrauterine alcohol exposure is known, there are still obstacles in the diagnosis and previous identification in the children of alcoholic mothers. (MESQUITA, 2009).

Tangent to the implication of the teratogenous use of alcohol, putting life and its quality at risk, the concept of Patient Safety is necessary. This term has been present since Ancient Greece when the Father of Medicine, Hippocrates (460 to 370 BC), coined the postulate primum non nocere, which means "first do no harm", based on the awareness that care has the potential to cause damage if not done correctly.

In this sense, the quality of pregnancy is one of the factors directly proportional to prenatal alcohol consumption. In 2007, in Rio de Janeiro, it was identified that 40.6% of pregnant women had drunk alcohol at some point during pregnancy, and of these, 10.1% had consumed it by the end of the gestational period. In 2009, in a poor community in São Paulo, 21.4% of pregnant women consumed this substance throughout their pregnancy and 33.3% only at some point during it. (MESQUITA, 2009) In 2012, in turn, in Minas Gerais, 23.1% of the group in question consumed in some of the quarters and 6.1% in all of them.

The devastating consequences of irrational alcohol use are completely preventable if there is alcohol abstention immediately before and during pregnancy. According to the fact, it is necessary that screening for alcohol use during prenatal care be done routinely, since the visibility and importance of the theme are still neglected by health professionals and Brazilian government agencies. (MESQUITA, 2009).

Even though the clinical presentation of intrauterine alcohol exposure is known, there are still obstacles with regard to the diagnosis and prior identification of children of alcoholic mothers. In this context, the guiding question of this research arises: what are the effects of Fetal Alcohol Syndrome on patient safety?

Seeking to analyze the proposed theme, this study is a scoping review research, which was conducted by the principles of the *Joanna Briggs Institute (JBI.*

According to the mnemonic PCC, the research question was defined, in which P (population) refers to patients with or without a diagnosis of APS, C (concept) to Fetal Alcohol Syndrome, and C (context) to patient safety.

The search was carried out in stages by three independent reviewers, as suggested by the JBI criteria, in the Science Direct, Cochrane and CAPES Portal databases. The inclusion criteria were: studies with high methodological rigor; of the last 10 years related to the theme and articles in Portuguese, English and Spanish.

The descriptors used were: Diagnosis; Fetal Alcohol Spectrum Disorders; Developmental Disabilities; Pregnancy, High-Risk; Fetal Alcohol Syndrome; Social Behavior; Child Neglect or Child Neglect; Patient Safety.

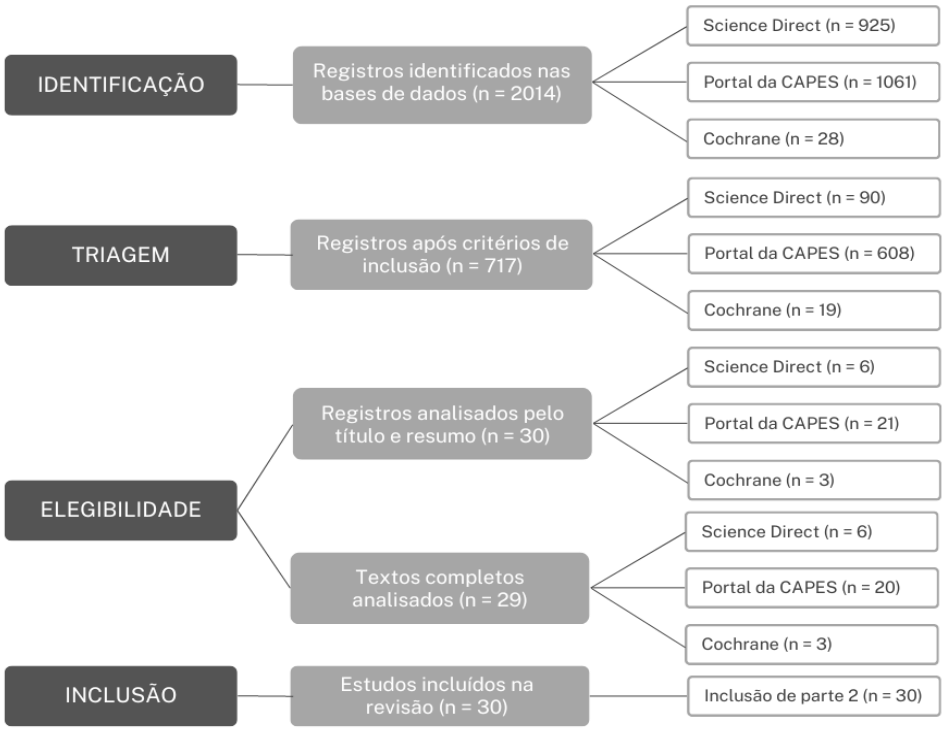
The article was filed in the *Open Science Framework* (OSF) under identification *of*: https://doi.org/10.17605/OSF.IO/A39U8.

RESULTS

In total, 2014 studies were identified. After temporal filtering, there were 1164 articles available. After selecting by type of article and language, 717 publications remained. Also, with the screening of titles and abstracts, 30 were selected for reading in full and of these, 29 met the inclusion criteria. Finally, part 2 of one of the studies found was added to the group of selected articles, totaling 30 articles. The disagreements between the reviewers were resolved by consensus.

The article selection process can be found in the PRISMA-ScR flowchart (Figure 1), according to the recommendations of the JBI.

FIGURE 1. Selection Process Flowchart



Source: authors (2023)

The publications of the first and last 5 years of the time filter placed, from 2012 to 2022, were equal (46.67%), with emphasis on the year 2019, which had a production of 26.67% of the studies, followed by the year 2014 (16.67%).

According to geographic distribution, 12 studies were conducted in the United States of America (USA), followed by Australia (seven) and Canada (six). Two articles are Brazilian, two are European (Switzerland and Italy) and one is from South Africa. In general, the research covered different methods, such as: review, cohort, quantitative and qualitative approaches, exploratory, randomized and case study. In addition, 96% of the articles were found in English.

After an in-depth reading of each study that made up the final sample, it is possible to apprehend categories, that is, outcomes that were repeated or converged. Pedagogically, the results found were divided into categories, which will be discussed sequentially:

DEFINITIONS AND CONCEPTS

Prenatal exposure to alcohol is the leading cause of preventable congenital abnormalities and neurodevelopmental disabilities worldwide, especially in countries where it is considered socially acceptable. (HOWLETT, 2019; NASH, 2017; PAINTNER, 2012a) It was only at the end of the 60s that the first publications reporting the teratogenic effects of alcohol appeared. In 1973, Jones and Smith documented the patterns of physical and cognitive abnormalities of fetuses exposed to alcohol during pregnancy. (DOAK, 2019) Thus, with the identification of this phenotype, it was possible to

establish diagnoses and recognize the harmful effects of prenatal exposure to alcohol (PAE). (PAINTNER, 2012b).

For Miller (2013), the current terminology for alcohol-related disorders in neurological development creates dilemmas in the causal inference of prenatal alcohol exposure. In this sense, there are ethical and legal issues in diagnosing a child based on maternal behavior when the cause is not conclusive. Thus, it would be preferable to separate the descriptive and etiological aspects in the diagnosis, using a more generic term, such as "complex neurodevelopmental disorder", which encompasses risk factors, including prenatal exposure to alcohol. (MILLER, 2013).

However, currently the literature brings several terms and definitions for the consequences of gestational alcohol use. Fetal alcohol spectrum disorders (FASD) is a generic term that encompasses categorical medical diagnoses, from the complete presentation of fetal alcohol syndrome (FAS), to the most diverse variants, which include fetal partial alcohol syndrome (pFAS), alcohol-related birth defects (ARBDs) and alcohol-related neurodevelopmental disorders (ARNDs). (PEI, 2016) Although they are pragmatic, for Miller (2013), ARND and FASD have their own semantic, thematic and epistemic meanings. (MILLER, 2013) Later, the DSM-5 (Diagnostic and Statistical Manual of Mental Disorders, fifth edition) brought the nomenclature neurobehavioral disorder associated with prenatal exposure to alcohol (ND-PAE), as well as was also cataloged by the American Association of Intellectual and Developmental Disabilities, now in its twelfth edition. (AAIDD-12). (HOWLETT, 2019; HASKEN, 2021; WAGNER, 2018; SENTURIAS, 2014a; ADEBIYI, 2019; GREENSPAN, 2022).

Fetal Alcohol Spectrum Disorders (FASD)

The original nomenclature in English Fetal Alcohol Spectrum Disorder (FASD) supports the existence of a spectrum of diagnostic conditions, in the sense of being a non-diagnostic umbrella term. (KABLE, 2015) Thus, it can be used in the description of brain and body conditions that occur among individuals with PAE, including problems of cognitive, behavioral, adaptive, socio-emotional and physical functioning. Flannigan, et al. (2021) state that there will rarely be individuals with the same clinical presentation, but who, even without a formal diagnosis, may experience significant disability and adverse outcomes to PAE. (FLANNIGAN, 2021; NASH, 2017).

Alcohol-related neurodevelopmental disorders (ARND)

Unlike APS or pFAS, which require growth and structural formation as a diagnostic criterion, the English term Alcohol-related Neurodevelopmental Disorder (ARND) refers to the diagnosis of children with normal growth and structural development, but who present cognitive or neurobehavioral anomalies characteristic of PAE. These problems include difficulties in performing

tasks, communication, emotional control, motor coordination, academic performance, social interactions, and atypical physiological responses, such as sleep disorders and exaggerated sensitivity to sensory stimuli. For Senturias, et al. (2014a), of all the conditions represented in the spectrum, ARND is estimated to be more prevalent than APS.

According to Miller (2013), when trying to diagnose ARND, it is necessary to distinguish between the possibility of causality and retroactive statements in medicine. It is necessary to question the association between EAP and neurological disability, requiring epidemiological evidence based on extensive research. In addition, it is necessary to determine whether prenatal exposure to alcohol caused neurological disability in a specific patient. Thus, to establish retroactive causality in cases of prenatally exposed children who have cognitive, adaptive, and behavioral impairment but without physical characteristics of FAS, a high level of specificity in the relationship between exposure and outcome would be required. However, the evidence for this specificity is still weak. The term alcohol-related birth defects (ARBD) was discouraged due to the difficulty of attributing the cause. (DÖRRIE, 2014).

Fetal Alcohol Syndrome (FAS)

Fetal Alcohol Syndrome (FAS) includes the physical malformations of PAE. (NASH, 2017) The term contemplates the classic triad: abnormal facial features (such as flattening of the upper lip), growth retardation (lower height-to-weight ratio), and central nervous system (CNS) abnormalities (such as smaller head size). (PEI, 2016).

When the individual has some of the three characteristics of FASD, but not all, he can be diagnosed with pFAS, ARND or ARBD, for example. These diagnoses encompass physical abnormalities linked to EAP but do not imply severity. It is important to emphasize that, although patients with APS have the classic triad, their symptoms are not necessarily more severe than individuals with the other three diagnoses. (PEI, 2016).

Partial Fetal Alcohol Syndrome (pFAS)

pFAS is diagnosed in the presence of facial dysmorphologies that meet the criteria for APS, together or without other abnormalities of the central nervous system. (DOYLE, 2015).

Neurobehavioral disorder associated with prenatal alcohol exposure (ND-PAE)

Proposed by the DSM-5, in the section "Conditions for Further Study", the new terminology Neurobehavioral Disorder associated with PAE is enlightening, with the aim of representing the range of neurodevelopmental and mental health symptoms associated with PAE. (DÖRRIE, 2014) Diagnostic criteria include the confirmed presence of PAE, but do not emphasize the need for the

presence of facial or structural features. For example, individuals diagnosed with EAP may also be diagnosed with Fetal Alcohol Syndrome (FAS) or partial APS. (KABLE, 2015).

TABLE 1. Terms and Definitions

Fetal Alcohol Spectrum Disorders (FASD)	Generic nomenclature that refers to the spectrum of categorical diagnostic medical conditions. Umbrella term. (KABLE, 2015; FLANNIGAN, 2021)
Alcohol-related neurodevelopmental disorders (ARND)	Presence of cognitive or behavioral abnormalities with confirmed EAP. (HASKEN, 2021; SENTURIAS, 2014a; HASKEN, 2021)
Fetal Alcohol Syndrome (FAS)	Complete syndrome. Characteristic facial dysmorphologies, growth retardation, CNS anomalies. With or without confirmed PAE. (PEI, 2016)
Partial Fetal Alcohol Syndrome (pFAS)	All or some characteristic facial dysmorphologies in conjunction or not with CNS abnormalities. Some guidelines require confirmed PAE. (DOYLE, 2015)
Prenatal Alcohol Exposure-Associated Neurobehavioral Disorder (ND-PAE)	Deficiencies in the functional, neurocognitive, and self-regulatory domains, without necessarily facial or structural changes, with confirmed SAP. (DÖRRIE, 2014; KABLE, 2015; DOYLE, 2015)

Source: authors (2023)

MATERNAL FACTORS

Maternal profile and risk factors

Physical, neurobehavioral and social disorders resulting from exposure to alcohol in the prenatal period are a teratogenic consequence, as pointed out by the research carried out by Paintner, et al. (2012b), with children of women who had PAE in the United States. This fact is closely linked to the maternal role and lifestyle adopted during the gestational period. (PAINTNER, 2012b).

Tangent to the list, in the United Kingdom, according to Howlett, et al. (2019), women of reproductive age are in the group of highest alcohol consumers, with 41.3% of them consuming this substance during pregnancy. In addition, the results of the UK Infant Feeding Survey indicate that two out of five women confirm the use of alcoholic substances during pregnancy. These data support the aforementioned observed consumption in Western societies (20-30%), compared to the global average of 10%. (HOWLETT, 2019).

Even though alcohol consumption is as low as one drink per week, cases of violent behavior during childhood have been associated, which suggests that there is no safe amount of prenatal alcohol exposure. (DÖRRIE, 2014; KABLE, 2015) In addition, updated data suggest that a history of more than minimal alcohol exposure during pregnancy, prior to recognition of pregnancy, should be

sought. (KABLE, 2015) Therefore, maternal self-report of gestational alcohol use, spouse, relative, or friend who observed the biological mother drinking alcohol during pregnancy, even medical records, can confirm the use of more than the minimum exposure. It is recommended that the use of alcohol is not done when planning the pregnancy and throughout it, to avoid any type of teratogenicity. (KABLE, 2015; MUGGLI, 2014; ROCHA, 2020).

In a study carried out with 94 children living in orphanages in the Northeast of Brazil, described by Rocha, et al. (2020), it was found that half of the biological mothers had abused alcohol, resulting in the diagnosis of FASD in 17% of them. Several studies have been found that show alcohol consumption during pregnancy in Brazil reaching 57%. (ROCHA, 2020).

Finally, the prevalence of alcohol use by women can be linked to the lack of knowledge about the adverse effects of alcohol consumption at this stage of life. This fact corroborates the need for active intervention by health professionals on this topic during this period. (NASH, 2017) After all, the serious consequences of prenatal exposure to alcohol are the risk of fetal death and miscarriages, malformations with dysmorphic characteristics, growth deficiency, cognitive and behavioral deficits, which will be addressed in this article. (PAINTNER, 2012a; DÖRRIE, 2014).

Metabolic Factors

It is not yet known precisely what dosimetry data are needed to exceed a threshold for the occurrence of adverse effects during pregnancy. According to Paintner, et. al. (2012a) and Dörrie, et. al. (2014), the consumption of 5 drinks in a period of 2 hours per week can be an important threshold for adverse outcomes in women weighing approximately 60 kilograms. (PAINTNER, 2012b; DÖRRIE, 2014).

The National Institute of Alcoholism and Alcohol Abuse (NIAAA) defines 1 standard drink as 14 g of ethanol. After ingestion, ethanol is easily absorbed by the stomach and enters the mother's bloodstream, crossing the placenta and quickly reaching the fetus and amniotic fluid, resulting in similar concentrations within minutes. Blood alcohol concentrations peak when absorption and metabolic enzymes match, and begin to decline when enzyme activity exceeds absorption. (PAINTNER, 2012b).

For Nash, et al. (2017), it is possible to feel the teratogenic effects of intrauterine alcohol 1 to 2 hours after maternal ingestion, which can vary depending on the dose, pattern, timing of exposure, and overall well-being of the fetus. The elimination of toxic by-products depends on maternal capacity, which may vary according to the pregnant woman. Most of the time, they end up accumulating, interfering with cellular functioning and leading to malformations in the cardiac, renal, neurological, skeletal, ophthalmic and auditory systems. (NASH, 2017).

Preventive factors

The first step towards prevention, or even intervention depending on the case, is to screen for alcohol use during pregnancy. (CHIODO, 2019) This assessment should be routinely performed by health professionals, including nurse-midwives, in primary care services, or in any care provided to pregnant women. The emphasis of this screening is on the identification of alcohol use and health education, and it can also be applied in preconception. (HOWLETT, 2019) After all, there is no amount of alcohol use that is proven safe for the development of the embryo or fetus. (CHIODO, 2019; HAYES, 2022).

However, the evaluation of alcohol consumption habits by pregnant women and women after pregnancy often involves feelings of guilt and stigmatization. (FERRAGUTI, 2019) Such feelings may cause mothers to be hesitant to report consumption. In addition, there is difficulty in obtaining correct information in the case of foster or adoptive families. (SENTURIAS, 2014a).

In view of this, to overcome the obstacles, screening instruments were developed especially designed for pregnant women. (FERRAGUTI, 2019) Decades of evidence have elucidated that universal screening by validated questionnaires is effective in this identification, in addition to providing consistent and clear information regarding the risk of alcohol consumption by this population. (NASH, 2017) In fact, screening is one of the pillars for medical decision-making in situations like this, because from the compilation of information obtained, counseling and possible intervention can be applied - which is cheap, fast and easy to execute. (NASH, 2017).

SOCIAL CONTEXT

Maternal

It is understood that the risk of FASD is highly dependent on maternal decisions during the gestational period, with regard to the frequency and quantity of alcoholic beverages consumed and the period of pregnancy in which this consumption occurred. Based on this, importance should be given to the factors and antecedents that can influence such individual decisions: vulnerability to alcohol, maternal age, culture in which they are inserted, ethnicity, nationality, socioeconomic factor, education, housing, smoking habit, poor diet, use of other drugs, marital status, unemployment, lack of support. (FERRAGUTI, 2019; DÖRRIE, 2014; PEI, 2016).

Prenatal exposure to alcohol, according to Dörrie, et al. (2014), whether due to social context or lack of knowledge of pregnancy, is not uncommon in early pregnancy, especially in the first weeks, however, it is also necessary to identify potential confounders that can influence the development of the fetus and pregnancy, such as smoking, drug use, eating habits and genetic factors. (DÖRRIE, 2014) Thus, Banerji, et al. (2017) explain that it is necessary to individualize the cases in order to strengthen the process of prevention and identification of FASD, in addition to

seeking to reduce the impact on the life of the diagnosed child. This should be prioritized in populations where there is a low rate of investigation of this syndrome, such as indigenous people. (BANERJI, 2017).

Children diagnosed

From the beginning of life, according to Dörrie, et al. (2014), children diagnosed with FASD suffer comparatively much higher adversities than those not diagnosed. Many of them are in environmental instability, as up to 90% of those with AFS are removed from home and are raised in multiple foster homes. (DÖRRIE, 2014) This vulnerability of care, according to Flannigan, et al. (2021), promotes several negative effects on the child's development, especially in the context of mental health. (FLANNIGAN, 2021).

Added to this is the fact that these individuals - found among the groups of lower socioeconomic status - experience disproportionately high situations of abuse, mistreatment, traumatic experiences and neglect - reaching the rate of 85% of them. These children then live in a constant state of "double jeopardy", due to the diagnosis itself and the associated complications. (FLANNIGAN, 2021; KABLE, 2015; PEI, 2016).

Based on this scenario, Flannigan, et al. (2021) state that it is possible to identify protective factors that can provide better results in the child's development, such as a safe, welcoming, and stable home environment (regardless of whether with biological parents, adoptive parents, or relatives), early diagnosis, and assertive intervention. Finally, it is worth mentioning that the factors related to environmental protection are modifiable, which provides an opportunity for intervention. (FLANNIGAN, 2021).

REGIONAL FACTORS

Worldwide

A highly rigorous scientific study, analyzed by Nash, et al. (2017), estimated that in the world population the prevalence of APS is around 1.5 cases per 1,000 births and FASD, about 15 per 1,000 births. For comparison, the authors presented this epidemiological factor with regard to autism and Down syndrome, which are 14 and 1.4 per 1,000 births, respectively. (NASH, 2017).

Alcohol consumption by women during pregnancy, according to Rocha, et al. (2020), is approximately 10%, which results in about 190 thousand children born with APS annually. Similarly, the consumption of this psychotropic drug by pregnant women has a different prevalence among countries, according to the authors, being 58.3% in South Africa, 36.5% in Russia, 27.0% in France, 4.8% in Canada and 10% in the USA. (ROCHA, 2020).

Developing countries

It is estimated that alcohol consumption above "occasional" use, according to Andrade, et al. (2013), is practiced by about two-thirds of the Western population, with alcohol dependence being among the five major global health problems among the age group of 15 to 44 years. In Brazil, this dependence is 5.7% among women and around three times as high among men. (ANDRADE, 2013) A consequence of this, according to Rocha, et al. (2020), is the presence of APS in 0.5 to 2 cases per 1,000 born annually in the country, which represents 1,500 to 6,000 children with APS. (ROCHA, 2020).

In this context, it is known that the understanding of developmental disability is inserted in and totally dependent on the cultural variety existing in the world, and there are, therefore, different points of view on this theme. According to Faruk, et al. (2020), in addition to the individual perspective of each culture, factors such as economics, politics, and geolocation are influencing access to quality healthcare for individuals with disabilities. In Southeast Asia, several societies consider it shameful to have children who are not healthy, thus promoting social deprivation and lack of support for these families, whether socially or in terms of access to health, such as diagnosis and treatment. (FARUK, 2020) In addition, among developing countries, South Africa is the country with the highest rates of FASD, ranging from 68 to 89.2/1,000 births. (ANDRADE, 2013).

Still on Brazil, Andrade, et al. (2013) evaluated a study in which researchers detected that 40% of women consumed alcoholic beverages three months before pregnancy on a weekly basis, and during pregnancy this number dropped to 20% and so on during the trimesters, up to a rate of 17.1% at the end of pregnancy. These same researchers evaluated the prevalence of APS in the city of São Paulo in 1964, which was 38.7 per 1,000 births. In addition, they observed that in Porto Alegre, 49% of the mothers of male institutionalized adolescents admitted to consuming alcohol during pregnancy, compared to 40% of the mothers of male students, with the presence of symptoms being more common in the first group. (ANDRADE, 2013).

In view of this, it is also important to understand that, according to Rocha, et al. (2020), there is great difficulty in evaluating some of the developing countries, such as Russia, in which the discrepancy between the data in several studies is considerable. According to the authors, this is due to the difficulty in correctly diagnosing these individuals. (ROCHA, 2020) Therefore, it is worth noting that not only socioeconomic conditions influence these data, but also the diagnostic method and the provision of services offered to this group. (ANDRADE, 2013).

Developed Countries

In developed countries, the early identification and diagnosis of developmental delay is one of the pillars of good health practices, and is even recommended by the American Academy of

Pediatrics. According to Faruk, et al. (2020), these countries prioritize the development of children, unlike those in which health practice is focused on identifying only acute diseases and growth itself. (FARUK, 2020) Such a perspective, according to Senturias, et al. (2014a) meets the needs of the United States, for example, since FASD has a prevalence of 0.2 to 1.5 per thousand births, and is therefore one of the most common causes of developmental and intellectual disabilities in the nation. (SENTURIAS, 2014a).

Still in the USA, in addition to FASD being common, the prevalence of APS has also been frequently found in minority groups, such as American Indians, and may be related to poverty and historical traumas, such as residential schools, according to Banerji, et al. (2017). In addition, there are economically significant costs associated with the necessary support that this group provides, which can reach at least 2 million US dollars per individual annually. (HAYES, 2022) In Canada, where FASD is one of the most common developmental disabilities and the estimated prevalence is 1% of the population, these costs are related to the judicial system (40%), health care (17%), education (17%), social services (13%) and others (9%). (PEI, 2016; BANERJI, 2017).

In New Zealand, according to Brookbanks, et al. (2021), although there are no studies that estimate the prevalence of FASD, it is estimated that alcohol has affected around 1 to 3 in every 100 live births. In Australia, in turn, according to Doak, et al. (2019), this prevalence is 10.82 per 1,000 births.

Finally, according to the studies by Banerji, et al. (2017), although FASD is found in all socioeconomic groups, some indigenous communities are highly affected, as seen in Inuit and Cree women living in Northern Québec, in which, even though fewer women consumed alcohol, those who consumed it did so in large quantities. Thus, even if there are indigenous communities in which alcohol is prohibited for women, those in developed countries are ten times more likely to practice this abuse than non-indigenous communities, resulting in higher rates of FASD in the country.

NEUROLOGICAL CONDITION

The clinical fetal alcohol spectrum goes beyond the physical abnormalities that result from PAE. Thus, it is possible to find in these individuals a compromised neurodevelopment, behavioral problems and disturbances of cognitive function. (BROWN, 2019).

CNS criteria used for the diagnosis of APS can be satisfied through documented structural, neurological, or functional anomalies. Structural criteria are met by means of anomalies detected by imaging or decreased head circumference (head size in the 10th percentile or smaller). Neurological criteria, on the other hand, can be considered in the examination and can be composed of focal symptoms (such as tremors, decreased visual or auditory acuity) or generalized symptoms, such as unprovoked seizures. Finally, functional CNS abnormalities are recognized by the way the child

thinks, learns, and behaves, as well as in the results of neuropsychological and developmental tests. (PAINTNER, 2012a; SENTURIAS, 2014a).

It is tacit to mention that, according to the research of Ferraguti, et al. (2019), exposure to gestational ethanol can impair the development, growth, and migration of brain cells and structures. Neurotrophins, which are fundamental in regulating these processes, are one of the main resources known to be disrupted by prenatal alcohol exposure.

In a general overview, APS can be diagnosed in children with compromised or normal structural development, but who have cognitive or neurobehavioral anomalies, which are comprehensively presented. (SENTURIAS, 2014a)

Neurocognitive functioning

In general, there is a consensus in the literature that non-specific cognitive impairment may be related to EAP. Long-term neurocognitive development is marked by failures in many domains, and often the level of independence does not match the age of the individual. In practice, cognition, executive functions, memory, and social perception are mostly impaired. (DÖRRIE, 2014).

In the study by Hasken, et al. (2021), it was noted that the physical growth of the child is directly related to predictions of neurobehavioral repercussions, with those who are born with low weight exhibiting the worst results. For Paintner, et al. (2012a), it is in adult life that the high rates of mental retardation and neurocognitive deficiencies are highlighted.

It is important to mention that children with fetal alcohol spectrum disorders may have withdrawal symptoms and present characteristics of nervousness, increased respiratory rate, hyperacusis, increased reflexes, and sleep problems. (PAINTNER, 2012a).

Cognition

Cognitive impairments differ according to the child's stage of development. (NASH, 2017) Even if some manifestations are clear, for infants and preschoolers, it can be difficult to characterize elements of EAP. According to Kable, et al. (2015), about half of young children show a marked developmental deficit in the first three years of life. Cognitive manifestations, in turn, become more evident at school age with learning delays, decreased IQ, communication difficulties and limited memory.

Global intellectual deficits or evidence of significant global developmental delay in early childhood are indicators of neurological dysfunction due to PAE. (KABLE, 2015; SENTURIAS, 2014a) In this sense, the research by Dörrie, et al. (2014) shows that the average IQ of children with APS is close to the lower-middle line range. The spectrum, in turn, can extend from mild mental retardation to the upper middle range. Nash, et al. (2017), on the other hand, showed in their study

that the IQ of affected children ranges from very low to normal, unlike adolescents and adults who have lower academic performance than suggested by their IQ score. According to Doyle, et al. (2015), although the most severe disabilities are regularly observed according to greater physical dysmorphology, the deficit in global IQ is not limited to appearance, nor to the history of EAP, with 20-50% of those with APS achieving an IQ below 70.

As a negative result, there is a recurring scenario of low grades, failure and school dropout. (PAINTNER, 2012a; KABLE, 2015) This information relates to evidence showing higher rates of incarceration, drug addiction, and mortality in this population compared to the general public. (BROWN, 2019).

Memory

Reduction in hippocampal volume was associated with impairments of working memory. Kable, et al. (2015), in their study, state that children with PAE have impaired memory, including auditory memory, for drawings, tales and spatial memory, that is, for both verbal and non-verbal materials. This failure in the storage of information serves both for free recall and for recognition in the forced/multiple choice test. According to the list, memorization difficulties are the result of the deficit in encoding new information and can be evidenced when the child demands frequent reminders, repeatedly makes the same mistakes, has difficulties remembering long verbal instructions or tends to lose their belongings. (DOYLE, 2015; KABLE, 2015) This high-risk behavior tends to be misinterpreted as oppositional. (DÖRRIE, 2014).

Visuospatial perception

Evidence of specific deficits in the perception and visuospatial construction of individuals with APS was found in the literature, including obstacles to visual memory and visual-motor integration with spatial memory. In this sense, these symptoms can be expressed as disorganized or poorly planned construction designs, difficulties in differentiating right or left. This leads to a negative impact on adaptive functioning capabilities in daily life. (KABLE, 2015; DOYLE, 2015; SENTURIAS, 2014a).

Executive functioning

According to the research of Wagner, et al. (2018), individuals whose mothers used alcohol during pregnancy were described as having deficiencies in executive function, mainly due to damage to the regions of the prefrontal cortex. Therefore, it is through these cognitive processes that one can plan, organize, attend, solve problems and inhibit answers. Also, it is through this mechanism that it is possible to self-regulate emotional responses and behavioral actions. (WAGNER, 2018).

Therefore, deficiencies in this functioning lead to changes in behavior and a drop in the level of learning, resulting in educational deficits in the child, such as when he tries to deal with complex school demands. (WAGNER, 2018) Other manifestations of this problem are poor planning and organization, cognitive inflexibility, and difficulty in solving problems. For these and other reasons, the diagnosis of APS at school age is more likely. (DOYLE, 2015; (KABLE, 2015).

Self-regulation

According to Doyle, et al. (2015), in order for a deficiency in self-regulation to be truly considered, a child must have deficits in at least one of the following areas: mood or behavior regulation, attention, and/or impulse control. It is important to mention that, for the diagnosis of ND-PAE, at least one symptom that characterizes a deficit in self-regulation is required, together with deficiencies in two other additional domains. (KABLE, 2015).

Mood regulation

Behavioral outcomes are largely affected by negative psychosocial agents, commonly experienced by individuals with FAS. For Kable, et al. (2015), parental substance abuse, mental health problems, child neglect and family violence are some of the adverse scenarios, reported in research, that surround children with PAE. Such influence contributes to problematic consequences, in particular in the area of behavioural regulation. In addition, the research by Dörrie, et al. (2014) states that there is an increase in prefrontal volume, the brain area responsible for logical reasoning and emotion control.

Individuals affected by alcoholic teratogenicity are at high risk of developing deficits in behavioral regulation, mood, and emotional functioning, as found in the studies by Dörrie, et al. (2014), including depressive disorders and negative humoral effects. In addition, externalization and internalization of problems have high rates of occurrence among these patients, as well as oppositional and conduct disorders. (DOYLE, 2015).

It is common to observe aggressive behaviors or depressive episodes in adults with FASD, however, such symptoms are rarely formally diagnosed and, in cases of internalizing disorders, often go unnoticed. According to population studies, up to 92% of young adults with FASD have some type of psychiatric disorder, with the most common diagnoses being ADHD (65%), followed by depression (47%) and panic disorder (21%). (DÖRRIE, 2014)

Attention deficit

Doyle, et al. (2015) state that parents and teachers highlight, in their reports, attention difficulties in children with APS. In addition, they found, in several studies, the emphasis on the

presence of attention hyperactivity disorders (ADHD) in children exposed to intrauterine alcohol. This number reaches 95% of those affected. In fact, this characteristic is one of the first to be noticed regarding self-regulation. (PAINTNER, 2012a) These children have higher rates compared to the typical population. The difficulty of shifting attention and sustaining mental effort to fulfill tasks among those on the fetal alcoholic spectrum have been described and replicated in animal models. (KABLE, 2015).

Compared to children with ADHD not associated with prenatal alcohol exposure, those who were exposed to teratogen have greater difficulty in verbal comprehension and perceptual reasoning. (DÖRRIE, 2014) In addition, adaptive skills in these children showed significant delay and lack of improvement with age, both in socialization and communication. In healthy management, young children without prenatal alcohol exposure need lower levels of adaptive support from caregivers. For Kable, et al. (2015), defiant and oppositional disorders (ODD), conduct disorders (CD), and ADHD should be carefully evaluated in the presence of PAE.

Difficulty in impulse control Often, the behavioral regulation or temperament of the individual on the fetal alcohol spectrum can manifest in a negative way, with irritability, emotional outbursts, or emotional lability. Especially, children with ASD tend to have impulsive responses and greater externalization compared to children with only ADHD, suggesting that there is difficulty in following rules, maintaining behavioral control and solving problems. (DOYLE, 2015).

Adaptive operation

To characterize the individual with loss of adaptive function, he/she must present at least two of the following items: communication deficit, social deficit, disability in daily life and disability in motor life (the first or second must be mandatorily present). (DOYLE, 2015; SENTURIAS, 2014a).

While the newborn and early childhood phase usually present growth deficits, congenital problems, feeding difficulties, irritability and sleep disorders, in childhood and early adolescence functional deficits of the CNS emerge and their consequences, as mentioned earlier. As postnatal environmental factors adjust, PAE has been associated with an increased risk of conduct disorders in older individuals. Over time, other inappropriate behaviors may also emerge. (DÖRRIE, 2014).

Communication deficit

Although not completely understood, the language disorders of children with APS have been documented in most studies. (KABLE, 2015) These deficiencies involve the comprehension of words, the ability to name, and expressive and receptive capacities. (DOYLE, 2015) Not infrequently, there is a significant delay in language acquisition, in addition to deficiencies in

syntactic, grammatical and semantic skills. It is tacit to mention the greater risk associated with hearing loss. (ANDRADE, 2013; DÖRRIE, 2014).

The participants in the study by Andrade, et al. (2013) showed considerable changes in the development of oral and written language, including failures in tasks involving categorization, definition and immediate memory, consistent with the literature found. For Dörrie, et al. (2014), children suffer mainly from reduced language comprehension and from not being able to produce a contextually integrated discourse.

According to Kable, et al. (2015), affected individuals exhibit dissent with figurative and abstract language, which leads to decontextualized and increasingly complex messages. In the clinic, these impediments are characterized by excessive loquacity, a clearly passive communication style, a tendency to make numerous comments that seem off-topic or out of the context of communication and/or understanding.

Disabilities of daily living

Deficits in daily living skills can include delays in using the bathroom, eating, or bathing. (KABLE, 2015) Other examples of insufficient daily living skills include difficulty managing daily schedules or problems arising from personal safety rules. (DOYLE, 2015; KABLE, 2015). Individuals with FASD, according to Kable, et al. (2015), often seem to trust strangers and tend to behave indiscriminately in society, potentially putting themselves in unsafe situations. (KABLE, 2015) Repeatedly, caregivers reported difficulties in the spatial orientation of children, who get lost even in known routes. (DÖRRIE, 2014).

Difficulties sleeping and handling of sensory stimuli can also be mentioned. The ability to calm down on their own seems to be one of the most common symptoms of neurological development associated with alcohol. Often, difficulties in understanding can result in prolonged tantrums. This problem becomes more evident in the preschool years when children are expected to have more self-control. In addition, since cause-and-effect reasoning is less efficient for children with APS, it becomes more difficult for them to learn from previous experiences. (SENTURIAS, 2014a).

Motor disabilities

A wide range of studies have shown that infants and children with APS have delayed motor development. This becomes evident during growth milestones, with direct impact on coordination, overall balance, delayed motor response, peripheral nerve conduction abnormalities, abnormal gait, and tremors. (KABLE, 2015) These deficiencies include both gross and fine motor skills. In the gross motor domains, children have difficulties with postural control and, in the fine domains, hand-eye coordination, finger dexterity, strength and motor speed are impaired. (DOYLE, 2015; SENTURIAS,

2014a; KABLE, 2015) In early childhood, CNS dysfunction can lead to poor sucking and irritability. For Dörrie, et al. (2014), many of the children with FASD suffer from motor difficulties regardless of IQ.

THE INDIVIDUAL WITH FASD IN SOCIETY

It is notorious that many of the individuals diagnosed with FASD present, in addition to physical, neurological and cognitive factors, several significant behavioral and social alterations. Such alterations are called secondary disabilities associated with FASD, and these are exacerbated especially when there is no support for the individual and his or her network. These social and psychological problems involve several areas and can manifest themselves as: educational interruption, employment difficulties, inappropriate sexual behavior, substance abuse, psychiatric conditions, psychopathologies, problems with the judicial system, among others. (BRINTNELLA, 2019; LARRANDABURU, 2019; NASH, 2017; KABLE, 2015; FLANNIGAN, 2021; HAYES, 2022; PEI, 2016).

Due to this, according to the article by Chiodo, et al. (2019), the fact that there are several costs throughout the life of the person with FASD is corroborated, which are very individualized and difficult to estimate accurately, but remarkably considerable, and can range from hundreds of millions to billions of dollars. Thus, it is essential to invest in prevention and health education, screening, diagnosis and possible treatments and rehabilitation that may be related to the syndrome. (CHIODO, 2019; FARUK, 2020; CHIODO, 2019; FARUK, 2020; PEI, 2016; FLANNIGAN, 2021).

Behavior and socialization

Among the secondary disabilities observed in individuals with FASD, Doak, et al. (2019) emphasized the difficulties that these people have in relation to behaviors and relationships. According to the author, starting and maintaining friendships and regulating emotions are some of them. It was also observed that the presence of antisocial behaviors and the practice of intimidation in places where they live together, such as school, are frequent in this group, which also has a high rate of mental health comorbidities and suicide.

According to Dörrie, et al. (2014), this change in social-emotional behavior occurs from the beginning of the child's socialization in the early years of education, when social adaptation occurs. Even though the FASD influences the severity of this situation, according to Dörrie, et al. (2014), it is possible to observe that the child, between 6 and 7 years of age, presents behaviors such as aggressiveness, delinquency, impulsive temperament and reduced capacity to process emotions.

In relation to the socialization of the child, Doyle, et al. (2015) point out that the difficulties occur because during a social interaction, individuals are required to have several skills - such as

cognition, attention, memory, communication and linguistic organization and understanding the other person's point of view - which this group has difficulty in managing, which makes the task painful. Also in the same article, it was reported that children on this spectrum may have a propensity to use ambiguity and not correctly understand the meaning of words in a narrative, consequences of which are friendliness towards strangers, misunderstanding of social consequences, which leads them to the serious relationship they have with the justice system. (DOYLE, 2015; LARRANDABURU, 2019) In this way, it is possible to understand the large expenses associated with the course of the life of the individual with FASD, after all, the loss of productivity and difficulty in arranging and staying at work is a consequence of difficult socialization. (BANERJI, 2017).

The judicial system

Individuals with FASD have substantial involvement with the justice system, according to Brintnella, et al. (2019), given the social, neurocognitive difficulties and other secondary disabilities. In American studies analyzed by Dörrie, et al. (2014), about 60% of this group came into conflict with the law, with half the number of arrests; in the Europeans, this number was lower. Banerji, et al. (2017), reported that in a sample of 473 individuals with FASD, 12% of them, at the age of 9, were already involved in criminal activities. Therefore, as most of these individuals are related to the correctional system, it is essential that these places have the capacity to serve them. According to Brintnella, et al. (2019), the Canadian adult penitentiary system exhibits flaws in the screening and evaluation of these incarcerated people.

To understand the relationship between people with FASD and the prison system, it is essential to understand that exposure to alcohol in the womb can affect, from mild to significantly, the entire brain area of the developing fetus, especially the limbic system, responsible for impulse and emotional control, social judgment, and decision-making. In addition, this group has difficulty in reasoning abstractly, such as seeing the big picture, understanding the relationship between action and consequence, and learning from experience, which results in the fact that they are more easily placed in risky situations, as they do not skillfully predict when their actions and behaviors will cause conflicts with the law. Therefore, a Canadian analysis identified that this group is 19 times more susceptible to contact with the justice system compared to those not diagnosed with FASD. (LARRANDABURU, 2019).

Tangent to this line of reasoning, Brintnella, et al. (2019) presented in their study the Corrections and Community Connections (3C) program, which aims to monitor adult men who have frequent contact with the Canadian corrections system. Identified by the authors as an 18-month model project, the program addressed screening, diagnosis and other assessments, with the objective of optimizing the identification of this group, providing the return to the community based on the

development of life skills, in addition to promoting a support system for these men after returning to society. According to the authors, this sample of the 3C program made it possible to identify that violations of conditions are the main infraction committed, in addition to most self-declared gang members, facts that converge with empirical evidence presented by health and law professionals, who state that offenders with FASD follow legal supervision orders with difficulty, in addition to having a low response to treatment and higher rates of recidivism.

Analogous to the difficulty of individuals with FASD to effectively participate in the criminal justice system, due to the aforementioned limitations, this group is also disadvantaged in the trial procedures, given their inability to be tried. (BROOKBANKS, 2021) This is due to two aspects: the first is due to the insensitivity of the authorities and legal professionals, whether lawyers, judges, among others; the second, due to the limitations of the person with FASD due to the associated brain impairments, such as memory difficulties about the facts and their behavior, in offering instructions and evidence to lawyers, in being active in the defense process (becoming a spectator). Added to this, it has high suggestibility and an apparent coldness (a reflection of the low ability to understand the perspective of others), among others. Thus, it is concluded that there is a substantial risk of judicial error in these cases. (LARRANDABURU, 2019; BROOKBANKS, 2021).

From the identification of this social gap, the Canadian Justice, according to Pei, et al. (2016), recognized the vulnerability of this group and the possible obstacles in the judicial process, therefore, it joined the Juvenile Justice Policy Section in favor of preventing the involvement of children and adolescents with FASD with crime, by the National Center for Crime Prevention. It also provided FASD training to police officers and a network of assistance as it relates to care and intervention. Finally, these positions are of great value, given the need to guarantee the rights of the population with FASD.

In addition, Brintnella, et al. (2019) point out that in fact, the postnatal risks of individuals with FASD influence their immersion in crime, whether due to negligence, abuse, witnessed violence, home and family instability, vulnerability, among others. Among the sample of the 3C project, 57% of them presented at least one of the risks mentioned, since they are social determinants. Thus, early exposure to these risks has the potential to influence exposure to situations of high risk to oneself and others, as demonstrated by the crimes for which the sample was convicted: robberies, break-ins, crimes with weapons and drugs, driving motor vehicles. (BRINTNELLA, 2019; PEI, 2016).

Finally, it is worth mentioning the results of the 3C project presented by Brintnella, et al. (2019). The researchers analyzed that a positive result of the program and its objective of reinserting the individuals in the sample into society could be evaluated by the recidivism rate. The study followed the group for 6 months in the community and observed that, according to the participants,

the program helped to contain anger, manage stress and self-awareness, perceive behavior patterns, and improve self-esteem. They also reported the importance of physical exercise, initiated in the program, and, consequently, improvement in relationships and employment.

PHYSICAL CHARACTERISTICS

Prenatal exposure to alcohol, in addition to neurological and behavioral characteristics, may result in prematurity (below 37 weeks of gestation), being small for gestational age (<10th percentile for gestational age) and/or low birth weight (less than 2,500g regardless of gestational age), factors that promote greater risk to the child's normal development. In addition, growth restriction, characteristic of children diagnosed with FASD, may also present as a smaller head circumference. (NASH, 2017; HASKEN, 2021; ROCHA, 2020; FERRAGUTI, 2019) Based on this information, it is understandable, if there is knowledge of alcohol consumption during pregnancy, that these characteristics are early indicators of a risk of postnatal deficiency such as FASD, according to Hasken, et al. (2021), thus requiring referral for appropriate investigation.

In addition, in addition to what is observed at birth, diagnosed children may have several other physical characteristics such as short palpebral fissures, a thin vermilion border or upper lip, a smooth or flattened philtrum (vertical groove between the nose and upper lip), flattened nasal bridge, small nose turned upwards, maxillary hypoplasia, strabismus, ptosis, retinal malformations, epicanthal folds, narrow or high palate, heart defects, abnormal palmar folds, clinodactyly, camptodactyly, dental malocclusions, joint contractures, "railroad track" ears, hearing loss, hydronephrosis, microcephaly, among others. The first three characteristics mentioned are considered central to the diagnosis of APS, and the others are associated, but not exclusive, with prenatal exposure to alcohol. (FERRAGUTI, 2019; SENTURIAS, 2014a; NASH, 2017).

However, not all affected children have the physical characteristics, which promotes underdiagnosis in this group, resulting in less access to support and necessary interventions. (NASH, 2017) An example of this are pFAS and ARND, which have no involvement with physical parameters. Due to this, according to Hasken, et al. (2021), further studies are needed to better assess the relationship between prematurity and low birth weight and diagnosis within the FASD spectrum. In addition, it should be noted that many of the characteristics mentioned can be confused with other genetic and teratogenic syndromes, including the three main facial dysmorphia of APS: smooth philtrum (grade 4 or 5), the thin vermilion border (grade 4 or 5), and short palpebral fissures. (SENTURIAS, 2014a).

DIAGNOSIS

Given the prevalence rate of FASD in the USA, 9.1 per 1000 live births, it is likely that many children and adolescents will go undiagnosed. (PAINTNER, 2012a) As previously listed, the individual with PAE is susceptible to permanent damage and various functional problems. The study by Hasken, et al. (2021) showed that, in South Africa and the United States, the more trimesters of alcohol consumption, the higher the risk of FASD diagnosis. Brintnella, et al. (2019) point out that since disabilities are permanent, the identification, diagnosis, and provision of appropriate services are crucial to support and enhance an individual's ability to function in society.

According to Nash, et al. (2017), some factors that contribute to missed or inaccurate diagnoses are: (a) lack of familiarity with FASD, (b) absence of distinct physical signs, (c) lack of knowledge of the history of prenatal exposure to alcohol, and (d) high incidence of mental health disorders related to FASD. In addition, Doak, et al. (2019) highlighted the lack of knowledge and training of health professionals, linked to the lack of funding to support comprehensive and multidisciplinary diagnostic evaluations.

Prenatal diagnosis

Ferraguti, et al. (2019) estimate that FASD affects 2% to 5% of people in the United States and Western Europe, while in Italy, infant prevalence ranges from 2.3% to 6.3%. In this sense, the author makes it clear that there are several approaches to identify possible cases of FASD, such as analyzing the mother's alcohol consumption habits during pregnancy, examining alcohol metabolites in the biological fluids of pregnant women, and evaluating the morphoneural characteristics of the fetus. Furthermore, for Kable, et al. (2015), prematurity cannot be a critical factor for exclusion from EAP, since the fetus exposed to alcohol may be born with extreme prematurity.

Howlett, et al. (2019) address screening for alcohol use during pregnancy through maternal blood and urine testing, umbilical blood, and meconium, thus having the potential to detect EAP. In addition, the study by Ferraguti, et al. (2019) investigated in pregnant women the association between the biomarker of alcohol consumption, Ethylflucuronide (EtG), urine and indicators of the physical characteristics of FASD by prenatal ultrasound in the second trimester of pregnancy. The research also correlated the data with questionnaires administered to the mothers, such as AUDIT-C, T-ACE/TACER-3, TWEAK, and food diaries – in order to track alcohol consumption during pregnancy.

According to Brown (2019), the meconium test is the only screening tool available among the diagnostic resources for newborn babies when it is not feasible to obtain direct confirmation of alcohol exposure from caregivers. According to Brown (2019), this test analyzes the fecal matter that

accumulates during the second and third trimesters for chemical signatures of ethanol, indicative of PAE, and has an average cost of 175.00 US dollars.

At present, there are no diagnostic criteria available for the prenatal detection of fetal alcohol spectrum disorders. Even so, Paintner, et al. (2012a) emphasize the importance of confirming the initial diagnosis as soon as possible, since in this way, interventions will lead to better results. He says that "early recognition has the potential to decrease the need for later developmental interventions and reduce residential placement and entry rates to substance abuse treatment programs and correction systems."

Postnatal diagnosis

Due to the discrete and challenging nature of identification, individual FASD abnormalities are usually subtle, non-specific, and difficult to detect. (PAINTNER, 2012a) Thus, obtaining an accurate diagnosis can be challenging and require intensive resources, as addressed by Brown (2019). For him, diagnosis usually requires an extensive series of tests performed by several specialized health professionals, with a cost of up to 5,000 Canadian dollars in 2017. Thus, the author proposed screening for children suspected of having FASD before diagnostic tests, as a way to avoid testing in children with a low probability of receiving a diagnosis.

Early diagnosis of FASD, before the age of six, provides early intervention and care, reducing rates of secondary disabilities such as mental health problems, inappropriate sexual behavior, drug abuse, incarceration, and school exclusion. (BANERJI, 2017; ANDRADE, 2013) In addition, it helps to reduce the risk of future pregnancies with prenatal exposure to alcohol. (HOWLETT, 2019) It therefore helps the child to be inserted more quickly into special assistance services, especially by preparing him for the school years and improving life skills by minimising the sequelae resulting from mental deficits. (BANERJI, 2017; ANDRADE, 2013). Faruk, et al. (2020) complement this, saying that one of the ways to identify the characteristics of FASD is the monitoring of developmental progress, monitoring and observation of children's advances by parents or guardians, who play a primary role in this scenario.

As the child grows, the diagnosis of developmental disorders becomes more identifiable (PAINTNER, 2012a). The authors also state that most cases of FASD are identified when the child is in the ideal window of 2 to 16 years of age – a period in which it is possible to perform an assessment of cognitive development, speech and language, attention, fine and gross motor skills, and other aspects of delayed or aberrant neuropsychological functioning. It is tacit to mention that, according to Paintner, et al. (2012a), information on the diagnosis of FASD in adults is limited and in the elderly it is practically non-existent.

Therefore, the diagnosis of this condition depends on the presence of a set of diagnostic criteria related to four distinct categories: facial features, growth retardation, structural or functional problems in the central nervous system, and history of prenatal alcohol exposure. (DÖRRIE, 2014)

For the diagnosis of Fetal Alcohol Syndrome, defined by the American criteria of the National Center on Birth Defects and Developmental Disabilities (NCBDD), Centers for Disease Control and Prevention (CDC), and the National Task Force on Fetal Alcohol Syndrome, it is necessary that the individual has the triad (A) growth deficiency; (B) damage and/or impairment of the central nervous system; (C) at least two facial features. (SENTURIAS, 2014a).

Screening tools

In the research developed by Brown (2019), the author addresses the most diverse promising technologies in the identification of individuals with FASD. In the study, he evaluated the cost-effectiveness of the tools used to screen children suspected of having FASD before diagnostic tests. They are: i) Neurobehavioral Screening Tool (NST); ii) ethyl esters of meconium fatty acid (MEAE) (meconium test); iii) Maternal Drinking Guide Tool; iv) Medicine Wheel Student Index/Medicine Wheel Developmental History (Medicine Wheel); and v) FASD Screening & Referral Form for Youth Probation Officers (Asante Screening Tool).

When compared by Brown (2019), the meconium test and NST, both tools resulted in reduced costs and shorter diagnostic time compared to a diagnostic strategy without screening. Thus, screening newborns with meconium tests resulted in a reduced cost of almost 90,000 Canadian dollars for every 100 individuals screened, resulting in 38 fewer years of life diagnosed by age 18, with an incremental cost-effectiveness ratio (ICER) of $2,359.00. On the other hand, the screening of children with NST resulted in a reduced cost of $183,895.00 for every 100 individuals screened, with less than 77 years of life diagnosed by the age of 18 years, corresponding to an ICER of $2390.

Currently under study, the biomarkers of fatty acid ethyl esters (products of ethanol metabolism) and microRNAs (small RNAs that repress protein translation) may correlate with moderate to heavy alcohol consumption during pregnancy. Although promising, Nash, et al. (2017) point to the failure in clinical support of biomarkers at the moment, which do not have evidence in the high-level literature to accurately indicate EAP in screening. Other types of methyl ester screening can be performed, such as searching the hair and nails of mothers and newborns at the end of pregnancy, to then identify mothers whose children may be at risk. (DÖRRIE, 2014).

Thus, the study by Brown (2019) concluded that screening is related to a reduction in the use of health resources, but also results in fewer years of life with a diagnosis of FASD compared to a diagnostic strategy without screening. The author reinforces that in the event that diagnostic tests are

not available, screening should not be a sub-test for diagnosing, as it can lead to inappropriate conclusions and care.

Prevention

According to the research by Nash, et al. (2017), based on the results of more than 40 years of evidence, universal screening using validated tools would be effective in order to identify individuals vulnerable to PAE and convey clear warning messages about the risks and consequences of alcohol exposure during pregnancy. For Nash, et al. (2017), waiting until a woman or adolescent is aware of her pregnancy to advise her to stop drinking alcohol may be too late, preventing the opportunity for intervention. Also, the entire screening and counseling process is quick, easy, inexpensive, and refundable in many cases. In addition, when done frequently, it reinforces knowledge about FASD and thus its prevention.

ROLE OF THE HEALTH PROFESSIONAL

Before diagnosis

The health professional has a crucial role in providing the necessary information for the prevention and identification of FASD, which, if done early, significantly helps in maternal and fetal follow-up. Therefore, adequate screening of alcohol use during pregnancy should be one of the priorities of clinical practice, in addition to a thorough investigation of the home environment and the use of other substances. (HOWLETT, 2019; PAINTNER, 2012a).

According to Howlett, et al. (2019), screening and other early interventions have documented efficacy, and, if added to guidance on the consequences and severity of alcohol consumption during pregnancy, they have the potential to reduce adverse outcomes and improve developmental outcomes and possible treatments. In view of this, it is understood that health professionals need scientific knowledge on the subject in order to optimize all the steps involved in the recognition and care of the FASD.

Primary care providers, such as nurses, physicians, and even midwives, should educate non-pregnant women of childbearing age and pregnant women about the harmful effect of alcohol during pregnancy. (DÖRRIE, 2014) According to Chiodo, et al. (2019), the objective, in addition to instructing and identifying these women, is to reduce the amount and frequency of prenatal consumption in a practical way, thus reducing the risks of developing FASD.

Screening, as stated by Chiodo, et al. (2019), is considered an intervention in itself, since questioning about alcohol consumption, even if decontextualized, has the potential to raise awareness and change the consumer's profile. However, according to a survey conducted by Howlett, et al. (2019), in which 600 obstetrician-gynecologists in the USA were asked about the application of

screening, only 20% of respondents advised abstinence as safe at this stage of life, among the 97% who said they talked to pregnant women about the topic. In addition, around 13% did not know how harmful the use would be, and 4% of them believed that the consumption of 8 or more drinks consumed weekly by these women would not bring adverse effects. In addition, the authors observed that most of these physicians advised patients vaguely or only recommending reduction rather than alcohol cessation.

In light of the above, it is understood that there are barriers in the application of maternal alcohol consumption screening, which involve the professional's knowledge about the topic and its consequences, and the communication between the health professional and the patient in search of the evaluation of their habits (CHIODO, 2019; FERRAGUTI, 2019; HOWLETT, 2019) According to Chiodo, et al. (2019), many professionals report discomfort in questioning the use of alcohol by pregnant women, for example, since they suppose it is a delicate and very personal subject and that it will promote the feeling of guilt in the patient, which, according to the authors, does not occur for most of them. (CHIODO, 2019) Due to this, the application of the questionnaires addressed in the previous topic makes this consumption survey more objective. (KABLE, 2015) Therefore, overcoming such barriers can have a positive impact on maternal-fetal health and child development. (CHIODO, 2019).

Therefore, it is necessary to expand the population's knowledge, and thus raise awareness about the risks related to maternal alcohol consumption, beyond women, thus including their partners and family members in a routine way. (DÖRRIE, 2014) Rocha, et al. (2020) observed that initiatives against alcohol abuse circulate in Brazil, such as the National Policy on Alcohol promoted by the Ministry of Health in 2007, however, it is difficult to find specific information or implemented strategies that relate to FASD.

During diagnosis

It is a fact that FASD is a permanent condition, however, much can be done for diagnosed patients. (FERRAGUTI, 2019) For this, it is up to health professionals to be, in addition to what has already been discussed, prepared to establish an accurate diagnosis according to the standardized criteria established by the DSM-5. (KABLE, 2015) This diagnosis, in turn, requires a team of mental health professionals, such as psychologists and psychiatrists, however, it is necessary that primary care physicians are prepared to identify and refer such patients for diagnostic evaluation and to specialists, preferably before the age of 6, aiming at a better prognosis. (KABLE, 2015; NASH, 2017).

In addition, other professionals can, and should be, involved in this diagnostic process (and future management), such as primary care physicians, pediatricians, psychiatrists, neurologists,

geneticists, psychologists, occupational therapists, physiotherapists, speech therapists (especially audiologists), as well as social workers, educators and justice personnel who work with this group of people. (HAYES, 2022; ADEBIYI, 2019; BANERJI, 2017; PAINTNER, 2012a; KABLE, 2015) It is up to this multidisciplinary team, as far as they are concerned, to carefully evaluate and understand the needs of each patient individually, so that interventions offered by each specialty are effective based on the difficulties encountered, minimizing sequelae. (PAINTNER, 2012a; ANDRADE, 2013).

On the other hand, as discussed by Adebiyi, et al. (2019), professionals state that there is a lack of guidelines to be followed for an easier diagnosis and also for a better follow-up of the diagnosed child. This fact converges with the current underreporting of FASD or misdiagnosis (such as ADHD), which, in turn, are also associated with the lack of knowledge on the part of professionals about the syndrome. (HOWLETT, 2019).

After diagnosis

Early diagnosis is essential for a good prognosis, however, this will only become a reality if accompanied by efficient intervention. According to the study by Wagner, et al. (2018), the Fitz Roy Valley community pointed out that the lack of support in this process has affected the holistic development of their children diagnosed with FASD, which may be analogous to other communities. Based on this local reality, the author reported the application with positive results of "The Alert Program", developed by occupational therapists, which helps in the emotional, behavioral and relational skills of individuals with FASD, together with their support network, which can be the family and the school, depending on the group to which it was applied, since it is a program with applicability to multiple age groups.

Drug interventions

Currently, there are no treatments that promote cure in patients with FASD, but as for symptomatic patients, more studies are needed, as Dörrie, et al. (2014) address selective serotonin reuptake inhibitors, antipsychotics, mood stabilizers, tricyclic antidepressants, psychostimulants, among others. However, some are used off-label, such as stimulants to control ADHD symptoms, but this result is not observed in some children within the spectrum of the syndrome, as pointed out by Kable, et al. (2015). It is therefore up to the specialized professional to address each case individually.

Supporting interventions

Primary care physicians, according to Nash, et al. (2017), play a fundamental role in monitoring and supporting the support network of children diagnosed with FASD. Parents (or

guardians), when they receive the diagnosis, need to deal with the emotions involved in the new reality, accept the child's disabilities, relearn to understand it and receive active support, especially from people with experience. After all, as stated by Nash, et al. (2017), the diagnosis is both parental and child's, given the emotional weight and guilt often involved at this moment, with regard to the mother's alcohol intake during pregnancy.

In addition, professionals should offer therapeutic interventions related to education, executive and cognitive functioning, and social skills in order to prepare the individual for society. With these skills, the potential for delinquency, gang membership, indebtedness, substance abuse, and incarceration decrease, and the chances of independence and quality of life increase. (DÖRRIE, 2014; PAINTNER, 2012a; KABLE, 2015; ANDRADE, 2013) However, it is important to emphasize the need for clear and objective language for caregivers, in order not to overload them with an excessive amount of information, which, consequently, may result in the non-application and non-adherence of the recommendations provided. (HAYES, 2022).

It is also important that, together with the support network, professionals research and point out the vulnerabilities and strengths of each diagnosed individual, in order to then outline the plan of goals and future follow-up, as explained by Hayes, et al. (2022). Therefore, it is essential for the multiprofessional team to take a close look at the personal (emotional, social, psychological, educational) and environmental (inspirational and family context) aspects of the person with FASD.

Finally, it is imperative that the professional community and the population in general have access, understanding and awareness on the subject, in order to better support these individuals. In addition, to promote professional training opportunities, together with the work of elaborate and close monitoring with health professionals and support network, so that, finally, they are fully inserted in society. (HAYES, 2022; SENTURIAS, 2014b).

CONCLUSION

In this study, an in-depth reading and reflection on the outcomes of the different studies that made up the final sample studied was carried out. In this way, it was possible to map that the deficit in the diagnosis of Fetal Alcohol Syndrome and its similar, negatively affects the patient's safety and modifies their social behavior.

In view of the scenario presented with 30 articles researched, it was possible to identify the complex and heterogeneous nature of the impact of the maternal profile and context, culture and historical-social legacy on individuals with FASD, since they are related to the etiology and epidemiology of the spectrum. In addition, it was observed the broad manifestation of the spectrum in the individual, with regard to physical and neurocognitive issues, adaptive functioning, secondary comorbidities, as well as difficulties in their social and interpersonal relationships.

In addition, issues inherent to the importance of health professionals in this context were explored, showing their role in raising awareness and active intervention in alcohol consumption during pregnancy. In addition, the reason for the urgency in the effective implementation of the various screening and diagnosis tools in the health system was listed. After all, early diagnosis is a predictor of a better holistic development of the individual, which minimizes any losses related to FASD.

Finally, although there are studies on this theme, it is believed that there is a need for research with a greater depth on this diagnosis and the consequences of not doing so, to the detriment of its direct effects on the individual's safety and social behavior.

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Acquisition of vehicles through consortium: An approach to its advantages and disadvantages

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Thainá Carvalho dos Santos[1] and Benedito Albuquerque da Silva[2]

ABSTRACT

The study presents an analysis of the advantages and disadvantages related to the acquisition of goods through consortium in comparison with other financing modalities available in the Brazilian market. The study was carried out based on research and data collected from financial institutions, consortium administrators, companies in the automotive sector and consumers who have considered the consortium's option for the acquisition of a vehicle, concentrating the analysis on automotive vehicles, such as passenger cars. In this way, a view of the relevant aspects that are considered for consumer decision-making in this specific context was presented, seeking to contribute to the choice of the most appropriate vehicle acquisition modality for their needs and financial objectives, focusing on the consortium and its advantages. By considering the advantages and disadvantages of each option, consumers can make a more conscious choice, maximizing their investment and satisfaction. In the end, it was possible to conclude that although the cash purchase has a lower cost at the end of the plan, most consumers cannot have the value immediately for the purchase of the good since it can compromise the monthly family income, CDC financing and leasing are the options with the highest cost, making the consortium the most considerable option in the decision making for the acquisition of the good.

Keywords: Financing, Consortium, Management fees, ABAC, Leasing, CDC, Acquisition of goods, Acquisition modality.

[1] Bachelor of Science in Accounting
Federal University of Mato Grosso – UFMT
E-mail: thainasantosibc103@gmail.com
[2] Prof. Dr.
Doctor in Environmental Sciences and Agricultural Sustainability – UCDB - MS
Doctor in Accounting – UNR - Argentina
Federal University of Mato Grosso – UFMT
E-mail: ba.silva@terra.com.br

INTRODUCTION

The acquisition of vehicles is a need or desire of many people. However, its high value can make its purchase in cash a difficult and frustrating task for most people. Therefore, there are several acquisition modalities that are available in the market, which allow people to acquire them without having to have the full amount in cash.

Such modalities of acquisition of goods are: cash, direct consumer financing (CDC), leasing and consortium. Each modality has its specificities, generating additional costs that, reaching the end of the payment term, the total cost for the acquisition of the good can present considerable and decisive variations to finalize the acquisition of the desired good. Therefore, it is important, to assist the process of making a purchase decision, that the consumer has at his disposal, a comparative study guiding on the main advantages and disadvantages of each type of acquisition so that there is no frustration in the acquisition of the long-awaited good.

The research focuses on the issue related to the main advantages and disadvantages associated with the acquisition of vehicles through a consortium compared to other modalities of acquisition of goods, more specifically financing and leasing, and how do these factors influence the decision of consumers when choosing the method of acquisition of a vehicle?

The justification for this research lies in the need to help guide consumers in decision-making when purchasing goods, considering the financial and practical implications of each type of acquisition, highlighting: cash, direct consumer financing (CDC), leasing and consortium. With the information obtained, consumers will be better able to choose the method that best meets their needs and financial goals without compromising their entire assets.

The decision to acquire an asset, such as a vehicle, is influenced by a number of factors, including financial, practical, and personal aspects. Therefore, it is essential that consumers have access to detailed information that helps them in their decision-making. In this context, this research aims to deepen the understanding of the advantages and disadvantages associated with the acquisition of vehicles, specifically passenger cars, through consortium in comparison with other available financing modalities. The importance of this subject is also highlighted, considering that the economic and financial scenario is always in constant evolution. The research aims to provide a comprehensive, data- and evidence-based analysis of the advantages and disadvantages of consortium as a vehicle acquisition option.

To achieve this goal, the following specific objectives were considered:

a) To present a theoretical-conceptual contextualization about the goods and the different forms of acquisition available in the market; Investigate the market conditions of vehicle consortia, the advantages and disadvantages of this modality and b) Carry out a case study with the simulation of the acquisition of a good, more specifically, passenger vehicle, by different forms, with emphasis

on acquisition through consortia, which will make it possible to understand if this modality is more advantageous than the others.

The general and specific objectives established outlined the course of the research, seeking to investigate the issues related to the consortium of vehicles. The problem question highlights the need to understand how advantages and disadvantages influence consumers' decision to purchase a good, providing a clear direction for research

The survey methodology involved the collection of data from financial institutions, consortium administrators, companies in the automotive sector and among consumers who considered the consortium option when purchasing a vehicle. This comprehensive approach allowed for valuable insights into consumer experiences and perceptions of the consortium. Therefore, this research sought to provide a broad and enlightening view of the acquisition of vehicles through consortium, helping consumers to make more conscious choices that are aligned with their financial needs and goals. Through the analysis of the specific advantages and disadvantages associated with the consortium in comparison with the other modalities, this study seeks to offer a solid basis for decision making in the context of the acquisition of automotive vehicles in the Brazilian market.

The article is divided into sections, with the introduction, followed by the theoretical framework that gives theoretical support to, based on the methodology, present a case study and, subsequently, a discussion about the results, followed by the final considerations.

THEORETICAL FRAMEWORK

Vehicles fall into the category of Goods, in the legal, accounting and economic sphere, the concept of "goods" refers to resources or assets that have economic value and can be controlled or owned by an entity or individual.

In addition to tangible and intangible as described by Marion (2009), it is important to analyze this distinction, since each type of asset has a different legal treatment. The legal system establishes several disparities for each category of property, for example, the transaction of real estate is considerably more complex than that of movable property, as an example, if you take the case of the sale of a house with a value above thirty minimum wages, it is necessary to obtain a public deed, while the sale of a video game between individuals does not even require a written contract.

Assets can be classified into movable and immovable, in this sense, they can have the following classification:

As defined by Martins (2019), "movable goods are those that can be transported from one place to another without prejudice to their integrity and specific function, characterized by physical mobility". In addition, movable property encompasses a wide variety of items, such as personal

effects, appliances, inventories of goods, portable equipment, vehicles, among others. Mobility and ease of transportation make this type of asset extremely relevant both in the personal sphere and in the business context, being a category of goods that are not permanently fixed to the ground, are susceptible to physical movement and can be easily moved from one place to another, maintaining their characteristics and utilities.

In relation to real estate, according to Gonçalves (2020), "they are those that are naturally or artificially incorporated into the soil, in a definitive way, forming an inseparable unit, and cannot be removed without destruction or damage to the asset". Real estate encompasses several categories, such as land, houses, apartments, buildings, constructions, plantations, among others, and plays a fundamental role in the economy and society, being the object of real property rights and the target of commercial transactions and negotiations.

The main modalities available for the acquisition of goods are: cash purchase , direct consumer financing, leasing and consortium.

CASH PURCHASE

According to Rezende (2018), "cash purchase is an interesting option for consumers who want to save money, as a discount is often offered to those who pay in full at the time of purchase". Cash purchase is a type of acquisition in which the consumer makes the full payment of the value of the good or service at the time of the transaction, without resorting to financing or installments. This form of payment offers advantages for both the buyer and the seller, being a widely used option in various commercial transactions.

DIRECT FUNDING

In financing operations, the financial resources are intended for a specific purpose or segment provided for in the contract. As an example, real estate, industrial and rural financing can be cited. In this case, the financed asset itself can serve as collateral, making the operation safer for the lender and less costly for the borrower. The rules for granting them are stricter, and the procedures are more detailed. In general, financial institutions carry out the analysis of the financial capacity of the borrower, the evaluation of the asset to be acquired and, eventually, other guarantees offered by this proponent (BACEN, 2018, p. 1).

When requesting financial operations from a bank, such as the financing process, for example, it is extremely necessary that you know the operation and everything that involves it, such as the application of financing charges. Financing charges are responsible for making credit operations less advantageous. To understand what financing charges mean, know that they are

applied to the interest of financial operations negotiated with banks and credit operators (KONKERO, 2018).

In financial credit operations, such as the CDC, charges are charged, and, according to Cavalcanti (2009, p. 48), represent "the rent paid for the use of a certain amount of money", while the interest rate is defined as "the mathematical relationship between the interest charged or paid at the end of a certain period of time in relation to the amount due at the beginning of that period" (CAVALCANTI, 2009, p. 48). The Central Bank (2018) clarifies that there are no predefined limits for charging interest on operations such as overdraft, special credit, credit card, working capital and acquisition of goods, allowing financial institutions to establish their own interest rates.

In addition to the interest rate, the Total Effective Cost (CET), as defined by Resolution No. 3,517 of the Central Bank of Brazil (2007, p. 1), encompasses "all charges and expenses of credit and financial leasing operations, contracted or offered to individuals", such as insurance premiums, registration fees, renewals and other fees practiced by financial institutions, as well as the Tax on Credit, Exchange and Insurance Transactions, or those related to real estate securities (IOF) (BRASIL, 2007).

The IOF rate is calculated proportionally to the payment term and currently consists of a fixed percentage of 0.38%, plus an additional 0.0082% for each day of loan, with a maximum limit of 3% per year on the amount of the credit. This means that in operations with maturities longer than 12 months, the IOF is calculated only on the tax corresponding to the first year (BRASIL, 2007; FERREIRA, 2009).

According to Ferreira (2009), the discharge of a loan can occur through different amortization systems, which, in the words of Dutra (2010, p. 187), are "the various ways used by creditors to receive the principal capital and interest from the debtor". For the purposes of this study, the French Amortization System (SAF), also known as the Price Table System (SPT), will be adopted, which, according to Bagatini (2010), is the most widely used by financial institutions, particularly suitable for vehicle financing, as it has a relatively short payment term and fixed installments, regardless of fluctuations in economic indices.

LEASING OR LEASING

Fletcher, Freeman, Sultanov and Umarov (2005) emphasize that *leasing* is a contract between two parties, in which one party, called the lessor, grants the right to use an asset to another party, the lessee, for a specific period, in exchange for agreed payments. According to these authors, *leasing* represents a financing tool aimed at the use of machinery, equipment, vehicles or property. It is important to note that lessors can be various institutions, such as banks, leasing companies,

equipment suppliers, or financial institutions other than banks. This approach reinforces the central idea of the concept of *leasing* presented by Fletcher et al. (2005).

The categorization of *Leasing* changes according to the criterion used, whether in relation to the length of the contract, the purpose of the transaction, the method, the essence or the object of the institution under analysis. Each type has its specific independence, maintaining its content and particularities, even though they are considered transactions of the same type, they differ in minor details. These details range from a conventional lease to a characteristic financing, as is evident in the operational and financial modalities. However, and according to this variation, it is emphasized that the main types of Leasing are: *Operational Leasing*, and Financial Leasing, from which the variations derive, *Leasing back*, *Self Leasing*, *Import Leasing*, among others (SAMANEZ, 1991).

Financial leasing is a contract in which the lessor or lessor acquires a material asset chosen by its client, to rent it to him in the future, for a certain period. It even seems like the rental description of a property, and not that this is totally incorrect; What differs from each other are the specific conditions that each one has. (YUBB, 2020).

Operating leasing is the operation in which the lessee does not intend to acquire the asset at the end of the contract. Operations using *leasing* have a cost advantage, as there is an exemption from charging IOF (Tax on Financial Operations), in addition to having the guarantee of the operation's asset. In relation to other modalities (financing and loan), *leasing* should present lower installment values. (YUBB, 2020, p. 1).

According to Bacen (2018, p. 1) in these operations, the ownership of the leased asset remains with the lessor (financial institution), which grants the right to use this asset to the lessee (client) during the term of the contract. Leasing contracts, however, offer the option of purchase of the asset by the lessee at the end of the contract. There is also the possibility of renewing the contract for an additional period or returning the asset at the end of the contract.

NBC TG 06 is based on international accounting standards, specifically IFRS 16, which deals with leasing. The purpose of AASB 9 (R3) is to establish the accounting principles for the lease from both the lessors' and lessee's perspectives.

Some of the main changes introduced by AASB 06 (R3) include that most lease agreements, including operating leases, must be recognized in the lessee's Balance Sheet, conveying greater transparency in the financial statements, i.e., it brings out the premise of the prevalence of essence over form.

However, to provide a more specific concept of lease according to NBC TG 06 (R3), the definition of "lease" according to Brazilian accounting standards can be considered:

> Lease: It is an agreement by which the lessor assigns to the lessee, for a certain period, the right to use an asset, in exchange for payments, usually in the form of lease installments. The lessee recognizes an asset for the right of use and a liability for the present value of the

> minimum lease payments. The right-of-use asset is recognized at cost, which includes the amount of the liability.

AASB 06 (R3) requires lessees to recognise an asset for the right of use and a liability for the present value of future lease payments.

CONSORTIUM

It is a type of acquisition that involves the union of individuals or companies with the objective of achieving a common goal. In this context, participants contribute with financial resources periodically, and through raffles or bids, they have the possibility of being contemplated for the acquisition of a desired good or service. The consortium is widely used as an alternative to traditional financing, allowing participants to carry out their plans collectively and on a scheduled basis.

The Consortium emerged in the 60s in Brazil at a time when consumer credit was scarce. According to Maílson da Nóbrega, "the idea [of bringing people together in a group to form a common savings account and acquire a good] was put into practice by a group of pioneers belonging to a well-organized community, that of Banco do Brasil employees. It was in Brasília that the first consortium emerged, then focused on the purchase of light automobiles." (ABAC, 2015)

The word "Consortium" involves the concept of solidarity of providing equal conditions to acquire a good or service. It originates from the Latin *consortium*, from *consors*, which designates the one who participates, who shares, companion (CONCEITO, 2013).

Consortium is the type of purchase based on the union of people - individuals or legal entities - in groups, with the purpose of forming savings for the acquisition of movable property, real estate or services. The formation of these groups is done by a Consortium Administrator, authorized and supervised by the Central Bank of Brazil. (ABAC, 2023, p.1)

A succinct definition of consortium is presented by Mantovani (2005) "The consortium is a form of programmed savings, with the purpose of acquiring goods or services, through self-financing of the consortium members themselves, carried out by a consortium administrator."

Consortium administrators are fundamental parts in this process, being responsible for organizing and managing the groups of consortium members, as well as carrying out the draws and contemplations in accordance with the rules established in the participation contract.

According to Silva and Marion Filho (2007), the word consortium comes from the Latin *consortium*, which means the relationship between one partner and another. Law No. 11,795 of the Consortium defines the consortium as:

> "[...] the meeting of individuals and legal entities in a group, with a previously determined term and number of quotas, promoted by a consortium administrator, with the purpose of

providing its members, in an isonomic manner, with the acquisition of goods or services, through self-financing (BRASIL, 2008, p. 1)."

The consortium system is composed of the categories of: light vehicles (formed by cars and light commercial vehicles up to 3,500 kg), household appliances, motorcycles and heavy vehicles, real estate and services (ABAC, 2018). Some concepts that make up the consortium system are important to understand its functioning (SILVA; MARION FILHO, 2007; BRAZIL, 2008). They are:

(1) The consortium group is a company with a defined term, formed by the consortium members for the acquisition of goods and services, whose size will depend on the number of monthly contemplations intended;
(2) the consortium member is the individual and legal entity that is part of the consortium group and contributes capital to the fund for the purchase of goods and services; and
(3) The consortium administrator consists of the legal entity responsible for the constitution of the group and the administration of the fund.

Still on the operation of the consortium system, due to the fact that the consortium is a kind of programmed savings, there is no interest, however, the Administration Fee (TA) is charged, which deals with the remuneration that the consortium administrator receives for managing the group's capital. It is also possible that a membership fee is levied, which consists of the advance of the amount corresponding to the TA together with the first monthly payment or installment (STEIN, 2006; SILVA; MARION FILHO, 2007).

Two more charges can be considered: the Reserve Fund (FR) and lender insurance. The FR is, according to ABAC (2018, p. 1), a "protection fund intended to guarantee the operation of the group in certain situations provided for in the contract", such as, for example, the exclusion of a consortium member, will have its remaining value at the end of the contract returned in equal amounts to the consortium members.

Lender insurance is intended to cover installments due in the event of death, disability and unemployment of any quota holder. Both the FR and the lender insurance are not mandatory and are at the discretion of the administrator to charge them or not, and must be provided for in the contract for participation in consortium groups (BRASIL, 2008; ABAC, 2018). The Common Fund (FC) is the savings made by the group, in which each participant has his corresponding share for the purchase of the desired good and service called quota (SILVA; MARION FILHO, 2007; ABAC, 2018).

Thus, the value of the monthly installment, in general terms, will result from the sum between the monthly value of the FC, the monthly value of the TA and the monthly value of the RF, as indicated in Formula 1 as mentioned by ABAC (2020).

$$Parcelamensal = FC + TA + FR$$, where:

FC - Common FundTA = Administration FeeFR = Reserve Fund

The granting of the letter of credit, which represents the amount available in the case of a consortium, may occur at the end of the term of the consortium or through a draw or bid (SILVA; MARION FILHO, 2007; ABAC, 2018). Draws and bids are held during the monthly meetings or in accordance with the contractual provisions. In the case of bids, they must respect the balance of the group and be offered in terms of a certain number of installments; thus, the contemplated consortium member will be the one whose bid corresponds to the highest percentage of bid offered (SILVA; MARION FILHO, 2007; ABAC, 2018 p.03).

To ensure that all participants have guaranteed purchasing power at the time of contemplation, the consortium system allows the value of the letter of credit to be updated according to contractual specifications or based on a price index suggested by manufacturers, automakers or service providers. It is important to emphasize that these corrections can be either upwards or downwards, as long as they ensure the acquisition of the good or service by all members of the consortium group (SILVA; MARION FILHO, 2007; ABAC, 2016, 2018 p.022).

According to ABAC (2016, p. 1), the update of the consortium portion after the credit correction follows the criteria established in the contract between the administrator and the consortium members. However, ABAC (2016, p. 1) offers an example of how the correction would affect the calculation of consortium installments, stating that "if your credit was updated by 5.85% (INCC from December 2015 to November 2016), your installments will also increase by 5.85%".

According to Silva (2012), consortia are an alternative for financial planning and a viable option for the acquisition of higher-value goods, such as automobiles, real estate and various services. This model has proven popular in several countries, as it allows a disciplined way of saving and acquiring goods without the need for high interest rates, as occurs in loans and financing.

Another relevant aspect of consortia is the factor of flexibility and adaptability to the different profiles and needs of the participants. As stated by Lunkes (2010, p. 132): "The consortium, by allowing the meeting of people with common interests, contributes to a more adequate risk management, in addition to providing access to goods and services that, in isolation, might not be accessible to some consortium members."

In addition, consortia can be seen as a financial education strategy, since they require discipline from participants to pay monthly installments and encourage long-term planning.

The main types of consortia that are most used by consumers of this type of purchase are: vehicles, real estate, services, appliances and electronics and medical services.

1) Vehicle Consortium: In the vehicle consortium, participants come together with the objective of acquiring cars, motorcycles or trucks. According to Mantovani (2005), "the vehicle consortium is a form of programmed savings, with the purpose of acquiring vehicles, through self-financing of the consortium members themselves".
2) Real Estate Consortium: The real estate consortium is aimed at the acquisition of real estate, such as houses, apartments or land. According to Silva (2012), "real estate consortia also contemplate their participants through draws or bids, enabling the realization of the dream of owning a home".
3) Consortium of Services: In this category, participants aim to acquire specific services, such as travel, study abroad, wedding parties, renovations, among others. According to Lunkes (2010, p. 132), "the participants contribute monthly to the common fund and, when contemplated, use the amount to perform the desired service".
4) Consortium of Appliances and Electronics: Some consortia are intended for the purchase of durable consumer goods, such as appliances, electronics and furniture. According to Mantovani (2005), "the consortium members contribute regularly and, when contemplated, receive the amount necessary for the purchase of the desired good".
5) Medical Services Consortium: This type of consortium is focused on the health area, allowing participants to use the contemplated amount to perform medical procedures. According to Lunkes (2010, p 137), "medical service consortia provide access to medical treatments and various procedures, ensuring the availability of the necessary resources".

According to ABAC (2023, p. 1) The Consortium System registered a record number of new quotas sold in 2022! There were 3.93 million new adhesions, an increase of 13.6%, compared to 2021. As a result, the volume of credits sold and the number of active consortium members also reached major milestones.

The almost 4 million new quotas resulted in the sale of R$ 252.09 billion in credits. The amount represented a growth of R$ 13.4%, compared to the previous year. September had the best sales result in 2022. Adding up all the segments of the System, there were 379.49 thousand in the month, totaling R$ 26.91 billion in credits sold.

The number of active participants in the Consortium System also broke a record in 2022. At the end of December, there were 9.41 million persons, 12.4% more than at the end of the previous year.

It is important to note that each type of consortium has specific rules and characteristics, and it is essential to carefully evaluate the conditions offered by each administrator before choosing to participate in a specific consortium group

METHODOLOGY

The research is qualitative and quantitative, as it uses the techniques of bibliographic research and case study with the presentation of numerical data that demonstrate the positive and negative points of the acquisition of goods through consortia.

THE TECHNIQUES USED WERE

Bibliographic research in books, newspapers, specialized magazines, websites, articles, monographs, among others. Case study, through the selection of a large passenger car model, so that comparative analyses of the main advantages and disadvantages of acquiring this good can be carried out, through one of the available modalities, with emphasis on the consortium modality.

The theoretical framework was elaborated based on a literature review related to the acquisition of goods, consortia, direct consumer financing, leasing and cash purchase. This includes definitions, advantages, disadvantages, and applicable regulations.

Searches for information were carried out in a variety of sources, namely:

a) Websites: websites of financial institutions, websites of consortium companies, government websites and websites of consumer associations; b) Articles: scientific articles published in academic journals, articles published in newspapers and specialized magazines searching for topics by keywords such as: funding; consortium; management fees; ABAC; Leasing; CDC Books: academic books, financial self-help books, economists' books, and accounting standards.

The case study was prepared with the collection of data and information, simulating the acquisition of a passenger vehicle by different modalities, including consortium, direct consumer financing, leasing and cash purchase, being:

1) For the cash purchase modality, a purchase at a car dealership was simulated.
2) For the direct consumer financing modality, a purchase simulation was carried out at a car dealership.
3) For the leasing modality, information was collected at a concessionaire by performing simulations.
4) For the consortium modality, data collection was carried out on the website of a consortium administrator through simulation on the website of a particular administrator where the amount of credit to be acquired, administration fee and desired term are included.

The data collected were organized in an electronic file consisting of a Microsoft *Excel spreadsheet* so that simulations could be made by the light vehicle consortium modality and financing.

This study focused on the comparative analysis between the data obtained through these simulations, seeking to understand the functioning of the consortium system in relation to financing and *leasing* in the decision making for the acquisition of vehicles.

All simulations were carried out without entry, but in the consortium there is the possibility of anticipation of contemplation through bidding. Thus, it is important to take into account the conditions of each type of asset financing.

PRESENTATION OF RESULTS

The comparisons between the modalities of acquisition of goods, more specifically cash purchase, financing, leasing and the consortium occurred as follows:

Well	HILUX CD SRV 4X4 2.8 TDI DIESEL AUT
Purchase mode	In sight
Value of the asset	R$ 292.000,00
(-) Benefits	R$ 951,00
Net Value	R$ 291,049.00

Source: prepared by the authors, based on the information collected (2022).

In this modality, there is no discount on the purchase, however, there are benefits such as revision and *insulfilm*, so to obtain the net value, the deduction of benefits was made.

Well	HILUX CD SRV 4X4 2.8 TDI DIESEL AUT
Mode	CDC
Value of the Asset	R$ 292.000,00
IOF	R$ 8.780,86
Tarifa/cesta 10.1	R$ 950,00
Natural person	R$ 550,00
Contract Registration (MT)	R$ 316,00
Life Insurance	R$ 4.701,06
Value Financed	307.297,92
Interest Rate	27.52% p.a. and 2.05% p.m.
Total Effective Cost (CET)	56.59% p.a
Term	48 months
Portion	R$ 14.037,33
Total Effective Cost	R$ 485,431.68
(-) Benefits	R$ 951,00
Liquid Value	R$ 484,480.68

Source: prepared by the authors, based on the information collected (2022).

Well	HILUX CD SRV 4X4 2.8 TDI DIESEL AUT
Mode	Leasing
Value of the Asset	R$ 292.000,00
Tarifa/cesta 10.1	R$ 950,00
Natural person	R$ 550,00
Contract Registration (MT)	R$ 316,00
Life Insurance	R$ 4.701,06
Value Financed	R$ 298,517.06
Interest Rate	27.52% p.a. and 2.05% p.m.
Total Effective Cost (CET)	30.15% p.a.
Term	48 months
Portion	R$ 9.831,49
Total Effective Cost	R$ 471,911.52
(-) Benefits	R$ 951,00
Liquid Value	R$ 470,960.52

Source: prepared by the authors, based on the information collected (2022).

In this modality, there is no discount on the purchase, however, there are benefits such as revision and *insulfilm*, so to obtain the net value, the deduction of Benefits was also made

Well	HILUX CD SRV 4X4 2.8 TDI DIESEL AUT
Mode	Consortium
Value of the Asset	292.000,00
Administration fee	13%
Term	43 months
Portion	R$ 7.673,49
Total Effective Cost	R$ 329,960.00
(-) Proceeds	R$ 951,00
Liquid Value	R$ 329,009.00

Source: prepared by the authors, based on the information collected (2022).

In this modality, there is no discount on the purchase, however, there are benefits such as revision and *insulfilm*, to obtain the net value, the deduction of benefits was also made.

Based on the comparative analyses of the vehicle acquisition modalities, namely: cash purchase, financing, consortium and leasing, it is possible to draw relevant conclusions about the advantages and disadvantages of each of these modalities, with the final values presented in table 05 below:

Mode	Final value in R$
The view	R$ 291,049.00
Leasing	R$ 470,960.52
Consortium	R$ 329,009.00

Source: prepared by the authors, based on the information collected (2022).

DISCUSSION OF THE RESULTS

The cash purchase is presented as the modality with the lowest total cost, not incurring additional financial expenses such as fees or interest. However, the high value of the good can be an obstacle for most consumers, making this option less accessible since not all consumers have the financial capacity to pay the full value of the good at once. The high value can exceed all available savings, making this type of purchase very limited and it is worth remembering that some people prefer to keep their money invested, generating income over time, rather than using their resources to pay for a good immediately. This is because, in some cases, the return on investments can outweigh the costs associated with financing.

Financing, in turn, offers the possibility of faster acquisition by paying monthly installments, but a detailed analysis reveals a considerably higher total cost due to interest rates and other incidental charges. There is also the bureaucracy required by financial institutions in the approval of credit for the purchase of the asset such as guarantor, down payment or even leaving another asset sold with collateral. The high interest rate present in financing makes income compromised and when investing it makes investors very cautious.

The consortium emerges as a more attractive investment alternative with a lower cost in relation to financing and leasing, offering the programmed and planned acquisition of movable property, real estate and services. The absence of an entry fee, direct interest, the possibility of increasing equity and contemplation over the contractual term are positive points, and also provide greater conditions for revenue management. As it is a long-term investment, planning minimizes the risk of debt and has more stability to pay the installments. However, it is necessary to consider that the administration fee applied that contributes to the total cost if the payment term of the installments is long, in some cases may be higher than that observed in the financing and the fact that the credit is not granted in the execution of the acquisition of the agreement for participation in consortium groups, it is necessary to contemplate by lottery or offer of bids.

As highlighted by Alcântara (2017, p. 52,53): The evaluation based on the Net Present Value (NPV) demonstrates that the option for the light vehicle consortium, with or without considering the return of the Reserve Fund (FR), has superior economic advantages compared to financing. This conclusion remains consistent, regardless of the term or price considered. In the context of the deadlines, it is observed that, as they are extended, the preference for the consortium is strengthened. This is due to the trend of NPV reduction over time, since the absence of interest relieves the time burden of the loan. Leasing, although it presents a different form of acquisition, reveals a disadvantage in terms of total cost. The fees and tariffs associated with leasing contribute significantly to the final amount to be paid, making this modality less attractive compared to

financing and consortium. It should be noted that consumers are currently finding it difficult to find this means of financing in most concessionaires, since most already have their own bank.

FINAL CONSIDERATIONS

The research aimed to demonstrate that it is more feasible to acquire a vehicle through the Vehicle Consortium in relation to other means of financing of the vehicle. In the end, the following findings were made that deserve to be highlighted:

- The cash purchase modality generates a total cost in the amount of R$ 291,049.00
- The CDC financing modality generates a total cost in the amount of R$ 484,480.68
- The Consortium modality generates a total cost in the amount of R$ 329,009.00

Thus, it is possible to infer that, although the survey found that the cash purchase has a lower cost at the end of the plan, most consumers cannot afford the immediate value for the purchase of the good since it can compromise the monthly family income. In this way, it is evident that CDC financing and leasing are the options with the highest cost, making the consortium the most considerable option in decision-making for the acquisition of the asset.

In the accomplishment of the research, some difficulties caused limitations, such as the issue of the little use of the leasing modality by car dealerships in the city of Cuiabá-MT, however, such limitations do not interfere with the considerations pointed out here.

It is possible to highlight that, when deciding on the modalities of vehicle acquisition, it is important to emphasize that consumers must consider not only the immediate convenience, but also the total costs involved and the particularity of each model at the time of acquisition in each option so that they can have the best result and satisfaction in the purchase of the good, financial planning is necessary for the acquisition of an asset.

And, in general, that due to the way the modality works, the use of the consortium is not recommended for borrowers with immediate needs, and financing through the CDC is indicated. However, if the consumer does not need the vehicle immediately, that is, regardless of the variation in installments, the consortium is a more advantageous option from an economic point of view.

There are several forms of credit in Brazil today, and the consortium system stands out for its scope, where it offers a variety of products and services. Considering the exploratory nature of this research and its purpose of encouraging the study of the subject, it is possible to highlight some suggestions for future research in this area:

1) Analyze the bids in the consortium, investigating their economic impact and identifying the most favorable scenarios for their use.
2) Conduct a study on the service consortium, addressing its origin, operation, benefits and contributions to the service sector.

3) To investigate consumer behaviour towards saving and financing during times of crisis.

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Analysis of the benefits of developing vaccines against leishmaniasis compared to the classic treatment

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Lucas Rocha Santana da Silva[1], Luiza Rocha Santana da Silva[2], Yane Keli dos Santos Costa[3], Fabiane Holanda Batista Porfírio da Rocha[4], Vitória Faustino Araujo de Sousa[5], Lívia Messias Pereira[6], João Pedro Fais[7], João Victor Barros Araújo[8], Suzane Nunes Barreto de Andrade[9] and Tiago Pinto Siriano[10]

ABSTRACT

Introduction: The treatment of leishmaniasis in humans faces challenges such as drug resistance and treatment abandonment. In this context, the search for an effective vaccine is crucial as a prophylactic measure. This study compares drug treatment and vaccination.
Methodology: An integrative review was carried out with the descriptors "leishmaniasis", "treatment", "vaccine" and "prevention" in databases such as PUBMED, Scielo, Medscape and DATASUS Tabnet.Results: Drug treatment includes three lines of medications, each with distinct challenges. On the other hand, vaccination is seen as a primary measure of immunoprophylaxis, with different generations of vaccines, including those based on the parasite's DNA. Discussion: In developing countries, such as Brazil, the need for effective and accessible treatment is pressing. Vaccination has advantages in cost and effectiveness, but more studies are needed to consolidate this form of prevention. Final Considerations: Investing in vaccines against leishmaniasis offers advantages in cost and effectiveness compared to drug treatment. Given the failures of conventional treatment, vaccination emerges as a promising prevention strategy.

Keywords: Leishmaniasis, Drug Treatment, Vaccine, Prophylaxis.

[1] Medical students of the University of Gurupi – UnirG
[2] Medical students of the University of Gurupi – UnirG
[3] Medical students of the University of Gurupi – UnirG
[4] Medical students of the University of Gurupi – UnirG
[5] Medical students of the University of Gurupi – UnirG
[6] Medical students of the University of Gurupi – UnirG
[7] Medical students of the University of Gurupi – UnirG
[8] Medical students of the University of Gurupi – UnirG
[9] Medical students of the University of Gurupi – UnirG
[10] Medical students of the University of Gurupi – UnirG

INTRODUCTION

Leishmaniasis is an infectious and inflammatory disease that, depending on the condition, can affect from the skin and mucous membranes to visceral organs - liver, spleen and bone marrow, has as its etiological agent, the protozoan of the genus *Leishmania*, and is transmitted between mammalian hosts through the bite of the infected sandfly insect, belonging to the genus *Lutzomyia* (SANTOS et al., 2022). There is a variety of mammals that are natural reservoirs for *Leishmania,* among them are: domestic and wild dogs, jackals, raccoons and rodents. Classified in 2011 as a neglected tropical disease by the World Health Organization (WHO), the clinical manifestation of Leishmaniasis in humans occurs in three types of conditions: cutaneous or cutaneous leishmaniasis (CL), mucosal leishmaniasis, and visceral leishmaniasis (VL) or kala-azar (GRIENSVEN et al., 2019).

Cutaneous leishmaniasis is characterized by the presence of lesions exclusively on the skin that appear after an incubation period ranging from ten days to three months with the presence of an erythematous papule that progresses slowly to a nodule, accompanied by regional adenopathy, with the presence of ulcers with raised borders being common. In addition, the condition is usually asymptomatic (GONTIJO et al., 2003).

Regarding mucosal leishmaniasis, it is the result of the progression of tegumentary leishmaniasis, a consequence of hematogenous and/or lymphatic invasion of the parasite. In almost all cases, it is possible to observe the involvement of the nasal and oral mucosa. On the other hand, in human visceral leishmaniasis, the main signs and symptoms are splenomegaly, hepatomegaly, pallor, weakness, intermittent fever, and can lead to death in up to 90% of untreated cases (CAVALCANTE et al., 2022).

As for its geographical distribution, it is "a health problem in tropical and subtropical countries, distributed on four continents (Americas, Europe, Africa, and Asia), with an annual record of 0.7 to 1.3 million new cases, however, it is more frequent in South American countries" (OLIVEIRA, 2022).

According to data from the World Health Organization, approximately 90% of cases of visceral leishmaniasis are reported in Bangladesh, Brazil, Nepal, India, and Sudan. Mucocutaneous leishmaniasis predominantly affects Brazil, Bolivia and Peru, accounting for about 90% of cases. Meanwhile, approximately 90% of cutaneous leishmaniasis cases are recorded in Afghanistan, Brazil, Iran, Peru, Saudi Arabia, and Syria (RATH et al., 2003).

Thus, in view of the excerpt exposed above, it is possible to highlight Brazil as a hotbed of leishmaniasis, which is confirmed by DATASUS records (2024) that measure a number of 50,438 cases of VL and 296,353 cases of ATL, in the period between 2008 and 2022, of which 9,218 cases of

visceral leishmaniasis and 129,426 cases of American tegumentary leishmaniasis, occurred only in the North Region of the country, the place with the highest endemicity of Leishmaniasis in Brazil.

During the spatial analysis of the occurrence of leishmaniasis, DATASUS (2024) highlights that 65.1% of VL cases are male patients and, in relation to ATL, the proportion increases to an expressive 75.5%. This is probably associated with the type of work they do.

With regard to age, the most affected age group is adults between 20 and 59 years old, since they correspond to a share of 48% of all ACL infections in the state. This scenario is not reflected in VL, in which 39.2% of all cases are in the infant and adolescent age group, from 0 to 19 years old.

Furthermore, as far as the treatment of leishmaniasis is concerned, it is aimed at the drug route. However, recent experiments have enabled advances in relation to vaccination about the disease in question. In this sense, studies focused on vaccine immunization are crucial due to the growing resistance, toxicity, and high costs of the drugs currently used in the treatment of this disease (GHORBANI & FARHOUDI, 2018).

In the face of this disease, drug treatment has numerous drugs with various properties that have their respective advantages and restrictions. Therefore, first-line drugs include pentavalent antimonials (Sb5+), which are used in consolidated use and are the basis of anti-leishmania chemotherapy. In addition, pentamidine and amphotericin B are second-line medications, which are used as options of choice after antimonials (CROFT et al., 2003; SUNDAR, 2001).

Furthermore, miltefosine, a third-line treatment option, is a registered anticancer agent for the treatment of the cutaneous and visceral form of the disease, and its oral efficacy and short treatment period are notorious as the main advantages of this drug (AGUIAR & RODRIGUES, 2017).

In this context, studies related to the treatment of leishmaniasis have been developed, and it is important to highlight the relevance of drug treatment. However, in a parallel path, there is the applicability of vaccines, as well as the importance of developing new studies on the subject, in order to increase their effectiveness in the long term.

The present study aims to promote an analysis of the benefits of the development of anti-leishmania vaccination in comparison with the classic drug treatment for leishmaniasis.

METHODOLOGY

This is an integrative literature review that used as a database articles from the Pubmed, Scielo, MedScape and DynaMed platforms with the descriptors "leishmaniasis", "treatment" and "vaccine". Searches were carried out in the Outpatient Information System - SIA/SUS and in the DATASUS Tabnet data platform, and data related to age and gender were considered in the elucidation of the information.

In addition, systematic review and meta-analysis articles in Portuguese and English were considered as inclusion criteria. As exclusion criteria, narrative review articles, epidemiological profile, integrative reviews and case reports during the search on the platforms.

RESULTS

Leishmaniasis, an inflammatory infectious and parasitic disease that affects from the most superficial tissues (integumentary and mucosa) to the bloodstream and visceral organs, has a pharmacotherapeutic treatment divided into 1st, 2nd and 3rd line, with pentavalent antimony (Sb5+), the main drug of choice in the anti-leishmania treatment, produced.

However, among the main factors that call into question the viability of this means of treatment: the exacerbated use of oral medications, the high cost of certain drugs, the risk of toxicity, and side effects (AMARAL & CHAVES, 2021).

Antimonials have two preparations available, sodium stibogluconate (Pentostam®) and meglumine antimoniate (Glucantime®) with similar efficacy for the treatment of cutaneous and mucocutaneous forms of leishmaniasis (BERBERT et al., 2018).

Sodium stibogluconate has been used in the treatment of cutaneous and mucocutaneous leishmaniasis in the United States and in the treatment of visceral leishmaniasis, except in Europe and regions of India where there is resistance to it. Eventually, treated patients may be hospitalized when pentavalent antimony is administered, since there must be a periodic assessment of cardiac conductance with electroencephalographic (EEG) monitoring and laboratory tests - blood count, renal function test, amylase levels, lipase, and serum transaminases (STARK, 2023).

In addition to systemic use, antimonials can be administered by intralesional infiltration in order to increase the concentration of antimony in the lesion - this process can be performed with a solution of 1-3 ml of antimony in a cycle every five to seven days and can be repeated two to five times (VRIES, 2015).

However, studies confirm that the risk of liver and kidney toxicity can lead to chronic health problems for patients using antimonials. In addition, over six decades of antimonial use, the parasite has had enough time to develop resistance mechanisms. These include, preventing drug activation, decreasing parasite absorption, increasing drug efflux, and high thiol loading on macrophages (TASLIMI et al., 2016).

In the second line of drugs of choice for anti-leishmania treatment are amphotericin B and pentamidine. The first is effective against pentavalent antimony-resistant mucocutaneous disease and visceral leishmaniasis, but its use is limited in reflection of the risk of toxicity (PAHO, 2023).

The second presents a conditional recommendation in systemic treatment for patients with the cutaneous form of the disease, which consists of the use of intramuscular pentamidine isethionate with 4 -7mg/kg/day in three doses applied every 72 hours (PAHO, 2023).

In view of this, more recent lipid preparations have emerged: amphotericin B lipid complex, colloidal amphotericin B dispersion and liposomal amphotericin B (MARTINEZ, 2006). The latter is strongly recommended for the treatment of VL in pediatric and immunocompromised patients in the Region of the Americas (PAHO, 2023).

In continuity, liposomal amphotericin B has been chosen as the drug of choice for VL due to its rapid metabolism and lower toxicity. This is perceived by the ability of the drug to circulate in the body for a longer period of time and penetration into tissues more effectively because it is a small particle (GHORBANI & FARHOUDI, 2018).

Regarding the levels of hepatotoxicity and, above all, nephrotoxicity, this drug is superior to conventional amphotericin B because it has lower renal clearance, since it is able to retain it in its liposomal architecture for longer compared to the classic form (ADLER-MOORE & PRO, 2009).

Intramuscular pentamidine, effective against VL, is the drug of choice to treat *L. (Viannia) guyanensis* in French Guiana, where antimonial resistance is prevalent (STARK, 2023).

In a study by Amato (1997), seventeen patients diagnosed with cutaneous mucosal leishmaniasis were submitted to pentamidine therapy (4 mg/kg) every other day, resulting in healing of the lesions in sixteen individuals (94.1%). This result demonstrates the efficacy of this treatment for cases of leishmaniasis resistant to antimonials and amphotericin B.

However, an important disadvantage for pentamidine is the need to be applied by deep IM, in an outpatient setting, due to the possibility of immediate side effects, such as hypoglycemia and the appearance of reactions (plastrons) at the application sites, if administration is superficial. In addition, resistance and toxicity mechanisms resulted in the loss of space for amphotericin B (NEVES et al., 2011; GHORBANI & FARHOUDI, 2018).

In the third line of anti-leishmania medications is miltefosine (hexadecyl 2-ethyl phosphate), an anticancer agent and affordable therapy, administered orally and well tolerated for VL. Miltefosine is the only oral agent that has been shown to be effective against leishmaniasis and is approved for pediatric patients over 12 years of age, weighing more than 30kg, and adults (DUTHIE & REED, 2014).

From an analytical standpoint, phase 2 and 3 drug studies in India showed that miltefosine administered orally was 95-97% effective in curing patients with Indian visceral leishmaniasis. Oral treatment of 2.5 mg/kg/day lasting 4-6 weeks was generally well tolerated. Adverse effects included gastrointestinal distress and elevated creatinine levels, resolved with discontinuation of therapy (STARK, 2023).

Another 2011 phase IV trial in Bangladesh concluded that monotherapy with oral miltefosine (2.5 mg/kg/day) for 28 days is effective in treating VL in children and adults. However, due to its long half-life, it is a teratogenic drug with resistance potential (STARK, 2023; KEYNAN et al., 2008).

In this sense, it is noteworthy that most anti-leishmania drugs are highly toxic, have resistance problems or require hospitalization, and are therefore inadequate (FREITAS-JÚNIOR et al., 2012). Conversely, vaccination has the potential to provide not only long-term protection against disease, but can also impact infectious reservoirs to reduce transmission (DUTHIE et al., 2016).

This fact is true because vaccines are effective means of inducing an immune response to produce immunoglobulins and memory lymphocytes to control the infection. In addition, these vaccines stimulate humoral and cellular immunity, especially a strong Th1 response and cytotoxicity cells (DUTHIE et al., 2016).

In addition, vaccination is an economic strategy for the prevention of infectious diseases and, therefore, emerges as a relevant tool in the fight against leishmaniasis. Currently, there are different forms of vaccines: killed vaccines - attenuated, recombinant, subunits, VLP (virus-like particles) and DNA vaccines (NOAZIN et al, 2008).

According to FIOCRUZ (1997), the attempt at immunoprophylaxis against leishmaniasis has been going on for more than 100 years, and the first experiences date back to 1912, when Charles Morley Wenyon inoculated himself with residues from a lesion of Oriental Button, obtaining typical lesions in a certain period after such an event. The event is called "leishmanization".

Starting from the aforementioned conception, we can identify the strong immunological "root" of this event. What happened to botanist Charles can be explained by the important role of dendritic cells in this immune reaction, since they are potent professional antigen-presenting cells (APCs) that effectively link innate and adaptive responses because, when activated, they mature and initiate immune responses by presenting antigens to T cells, through major histocompatibility complex (MHC) (NUNES et al., 2023).

Thus, vaccines emerge as effective and economical means as the aforementioned immunization model to prevent infectious diseases. The three generations of anti-leishmania vaccines emerged with the common goal of making leishmaniasis, regardless of its classification, a preventable and preventable disease (SILVA et al., 2013).

Ghorbani & Farhoudi (2018) classify leishmaniasis vaccines into three generations – the first generation comprised of vaccines with the killed form of the parasite, the second generation composed of modified vaccines in which specific genes were removed, and a third generation, in which vaccines were produced based on the parasite's DNA.

Thus, in the first generation of vaccines against leishmaniasis (*L. major, L. amazonensis and L. mexicana*) there are autoclaved formulations and those composed of inactivated whole parasites. These vaccines can be produced in an economically viable manner in developing countries, presenting an attractive advantage that motivates the exploration of the pentavalent preparation proposed in Brazil by Armijos et al. (2003). The inactivation of the parasite was performed using merthiolate, resulting in the vaccine known as Leishvaccine®, which did not include adjuvants (ARMIJOS et al., 1998).

Another approach consisted of an autoclaved vaccine formulation, which demonstrated similar immunogenicity results. In Venezuela, a vaccine containing

L. mexicana mixed with the adjuvant *Bacillus Calmette-Guérin* (BCG) has been developed and applied as an immunotherapy strategy in CL patients, but prophylactic investigations of these vaccines remain inconclusive due to the lack of acceptable results (GHOURBANI & FARHOUDI, 2018).

The second generation uses vaccines with modified parasites, in which essential genes, how Timiddilato synthase, Dihydrofolate reductase cysteine proteinase and/or biopterin transporter, were eliminated. When used, they are capable of inducing adequate adaptive immune responses, resulting in an inactivated infection and, consequently, absence of disease in vaccinated individuals (KEDZIERSKI et al., 2006). The genetic modifications include the introduction of "suicide tapes" into the genome of the *Leishmania* and, although there are ethical considerations about living challenges in therapeutic approaches, studies suggest that immune responses against live pathogens can provide long-lasting immunity (KEDZIERSKI et al., 2006).

Another class of second-generation vaccines are vaccines extracted from Leishmania, such as Leishmune®, designed for canine visceral leishmaniasis, using purified *L. donovani*. Despite promising effects, obstacles, such as difficulties in clinical trials, prevented progress to phases II and III. These bacterial and viral vaccines have shown promising results, indicating specific immune responses (AFRIN et al, 2002).

Continuing, among the second-generation vaccines is the non-pathogenic Leishmania, such as *L. tarentolae*, which was studied as a vehicle for the delivery of antigens for vaccine formulation through a new recombinant antigen. However, it will require further studies in rodent models, with also the need to understand whether the parasite can actually replicate within the mammalian host, ensuring adequate stimulation of the immune response, without causing any pathological change (BANDI et al., 2023).

The third generation of vaccines considers the use of purified *Leishmania* antigens, because in addition to studies indicating that DNA vaccines are more stable, they also have a lower production cost compared to recombinant protein vaccines (SUSCHAK et al., 2017).

The distribution of these vaccines does not require a cold chain, providing flexibility in combining different genes into a single product. The mechanism of action of DNA vaccines involves the activation of innate immunity through unmethylated CpG sequences, leading to prolonged expression of recombinant proteins (PALATNIK-DE-SOUSA, 2008).

Finally, previously mentioned antigens were tested as individual vaccines or in combinations, demonstrating promising results in preclinical studies. However, Phase III clinical trials are not yet available to fully validate the efficacy of these vaccines. The second generation of vaccines, incorporating native antigens, could significantly increase the average efficacy of vaccines, highlighting the need for additional studies and clinical trials in Phase III in the near future (GHOURBONI & FARHOUDI, 2018).

DISCUSSION

There are several therapeutic approaches for the treatment of leishmaniasis, however, the options currently available are not sufficient to achieve complete eradication of this infection. It is possible that drug therapy may be able to suppress infections immediately (DUTHIE et al., 2016; SILVA et al., 2013). However, it has been restricted due to adverse side effects and bioavailability (DUTHIE et al., 2016).

In this context, the pharmaceutical industry has invested little in the development of new drugs to treat this disease. In Brazil, the drug of choice is still methylgluchamine antimoniate, whose advantage is that it can be administered on an outpatient basis, thus reducing the risks associated with hospitalization (TEIXEIRA et al., 2023). It is worth noting that antimony derivatives, used as very effective leishmanicides, have been commercialized since 1945 (STECK, 1978). Over time since its market launch, it is clear that low dosages and discontinuous treatments contribute significantly to the increase in resistant forms of the parasite (RATH, 2003).

Although its mechanism of action, chemical structure and composition are not completely understood, there is evidence that pentavalent antimony is reduced *in vivo* to its trivalent form, which justifies the toxicity of the drug, in which a high incidence of adverse events is observed that tend to increase during the course of treatment, such as myalgia, arthralgia, nausea, vomiting and abdominal pain (RATH, 2003). There is still a lack of simple and accessible methods that allow antimony speciation to determine the content of Sb and its potential toxic contaminants (DAGERT et al., 2006).

Amphotericin B, the drug of second choice, is the most potent leishmanicidal drug available on the market, but it can cause acute toxicity, hospitalization and high costs as main disadvantages. As advantages, it is the only option in the treatment of pregnant women and patients who have contraindications or who manifest toxicity or refractoriness to the use of antimonials (MINISTRY OF HEALTH, 2017; MINISTRY OF HEALTH, 2020). Amphotericin B has a lower level of toxicity

compared to antimoniates, but amphotericin deoxycholate can cause adverse reactions such as allergic reactions, fever, chills, and phlebitis (LOUÇÃO et al., 2018). The emergence of lipid presentations has brought more safety with a reduction in adverse effects, however, it has a high cost as a barrier to its wide use, being indicated only in severe forms and intolerance to antimoniates (AGUIAR & RODRIGUES, 2017).

According to Stark (2023) and Teixeira et al. (2023), with regard to the alternative option to second-line treatment, Miltefosine, initially developed as an antineoplastic drug, has the main advantage of oral administration compared to parenteral drugs widely used in endemic countries for the disease. In addition, for Costa Filho et al. (2008), Miltefosine demonstrates efficacy in severe or refractory cases and, compared to N-methyl glucamine, it is less toxic and more easily administered due to its oral form. This characteristic is extremely important in the poorest regions of Brazil, where leishmaniasis is more prevalent, such as in the North, Northeast and Midwest.

Thus, adherence to treatment tends to be higher with the use of Miltefosine. However, it is crucial to highlight a disadvantage of this drug: the potential teratogenic effect. Therefore, their prescription for women of childbearing age should be done with caution, and it is essential to provide guidance on the use of contraceptive methods in these cases (COSTA FILHO et al., 2008; MACHADO & PENNA, 2012).

For Ghorbani & Farhoudi (2018), considering that drug therapy is limited due to its high cost, toxicity, and potential side effects, patients with visceral leishmaniasis die without any treatment. In this context, the long duration of treatment and availability are the main factors that increase the chance of drug resistance in underdeveloped countries (FREITAS et al., 2012; RAJASEKARAN & CHEN, 2015).

Vaccination against visceral leishmaniasis has the potential to offer additional benefits compared with medication. While medication tends to be directed at treating the disease after infection, the vaccine seeks to prevent infection in the first place by offering a preventive and proactive approach (SILVA et al., 2013).

In view of the immunization processes associated with the previously mentioned forms of disease control, numerous studies have shown that IFN-ɣ and TNF-α-secreting Th1 cells play a fundamental role in immunity against leishmaniasis infections, in addition to the ability of neutrophils to influence adaptive immune responses through the production of chemokines during leishmaniasis infections, resulting in the recruitment of other immune cells (BACELLAR et al., 2002; CONCEIÇÃO et al., 2016; MOLL and BERBERICH, 2001; PETERS et al., 2008).

Vaccination is shown to be a more effective control in the long term, although current results do not demonstrate sufficient efficacy for this therapy to be implemented in practice in the short term, requiring further studies to allow the advent of new vaccines that act in a preventive manner,

avoiding an overload on the health system due to the increase in the number of cases of the disease (JAIN, 2015).

The leishmaniasis vaccines developed so far have advantages and disadvantages in their practical applicability, including low production costs, making it attractive for further development, but there are still obstacles to the standardization and regularization of this type of vaccine (NOAZIN et al., 2008). In addition, vaccines with live pathogens containing special antigens or with the live parasite genetically modified to produce a long-lasting immune response are controversial due to ethical issues. In this context, the use of this therapeutic approach for humans has not yet been approved, making it difficult to consolidate it (GHOLAMI, ZAHEDIFARD, RAFATI, 2016; GHORBANI & FARHOUDI, 2018; REQUENA et al., 2004).

In this sense, another possibility would be the vaccine extracted from leishmania, also called Leishmune®, which has as its main advantages its efficiency in combating visceral leishmaniasis, but still faces problems related to their standardization and production (GHORBANI & FARHOUDI, 2018).

Additionally, in the study conducted by GONZALO et al. (2002), certain vaccines were created based on viruses. Some of these included viruses that expressed the LACK of L antigen. *infantum*, which provided strong protection against *L. major* in mice, and viruses that expressed the surface of the G46/M-2/PSA-2 promastigote protein, conferring effective protection against *L. amazonensis*. The encouraging results of these strategies attested to the ability to strengthen the specific immune responses of CD4 and CD8 cells during the immunization process, resulting in a significant increase in IL-2, IFN-ɣ and TNF-α in the groups that received the vaccines (GONZALO et al., 2002; RAMÍREZ et al., 2001).

Such data corroborate the study by Petitdidier et al. (2016), which highlight the importance of recruiting new approaches in recombinant technology to improve vaccine formulation, resulting in more purified, stable, reproducible, and safe products, with a potential reduction in adverse reactions. The administration of key immunogenic proteins offers a conducive means to induce integrated immune responses, especially against specific protective antigens.

Third-generation vaccines, such as DNA vaccines, have been shown in studies to be more stable than recombinant protein vaccines. In addition, they have a lower production cost, indicating a promising advance in the development and improvement of this type of vaccine compared to other more conventional vaccines and treatments (GHORBANI & FARHOUDI, 2018).

In this context, in light of the socioeconomic aspects relevant to the epidemiological distribution of Leishmaniasis in Brazil, the presence of a clear social vulnerability becomes evident, which hinders adherence to the available therapeutic options, which often require high cost and precise administration. Thus, it is essential to establish health measures that are in line with the

panorama of this zoonosis, with particular emphasis on the specific approach to the socioeconomic conditions of Brazil (MINISTRY OF HEALTH, 2020). Therefore, the implementation of a comprehensive prophylactic intervention aimed at reducing the incidence of the disease and preventing new cases emerges as an advantageous strategy.

Considering these factors, Duthie et al. (2016) state that drug therapy has proven to be ineffective in eradicating this disease. However, vaccination emerges as a means of providing lasting protection and mitigating the transmission of infection. Therefore, the implementation of extensive vaccination programs becomes imperative to reduce the incidence of leishmaniasis (LUNA & CAMPOS, 2020). Therefore, the importance of investments in research for the development of more effective vaccines is noted, as well as funding and collaboration between institutions and researchers to accelerate progress in this area (GHORBANI & FARHOUDI, 2018). Unlike medication, which requires intervention after exposure to the parasite, vaccination can provide continuous protection, reducing the likelihood of infection and contributing to the reduction of parasite transmission in the community (MINISTRY OF HEALTH, 2020).

Finally, the vaccine can enhance the formation of immunological memory, resulting in the sustained ability of the immune system to identify and fight the pathogen in the future, thus conferring long-lasting protection (JAIN, 2015). In addition, it is essential to initiate educational practices in affected communities, which can include awareness campaigns on the pathology, modes of transmission, symptoms and, when available, the importance of immunization (MINISTRY OF HEALTH, 2020). In addition, it is crucial to highlight the relevance of training health professionals for the effective diagnosis and treatment of leishmaniasis (MINISTRY OF HEALTH, 2017).

FINAL CONSIDERATIONS

The analysis of the aspects of drug treatment and vaccination for Leishmaniasis revealed potential advantages in the development of vaccines compared to drug treatments. This is particularly relevant in terms of cost, an essential factor for the implementation of immunization programs in developing countries such as Brazil. In addition, the importance of studies and the development of more viable therapeutic approaches in terms of efficacy, safety and cost has become evident. Consequently, research indicates that high cost, prolonged duration of treatment, and availability are the main factors that increase the likelihood of drug resistance in underdeveloped countries.

Brazil is recognized as an endemic region for Leishmaniasis, presenting one of the highest rates of the disease compared to the surrounding regions. This reality justifies the development of more effective treatment methods, which are currently based primarily on drug therapy, in addition to prophylactic measures aimed at combating the vector through environmental hygiene practices. Considering these factors, drug therapy has shown limited efficacy in eradicating the disease.

However, vaccination has the potential to confer long-term protection and reduce transmission of infection, culminating in the urgent need for comprehensive vaccination programs to reduce the incidence of leishmaniasis. It is observed, however, that the ideal vaccine has not yet been developed, highlighting the urgency of in-depth studies in this field.

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Neonatal uroperitonium in female equine: Case report

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Lorena Bueno Scarpioni, Caio Abílio Silva Lima and Gustavo Celotti

ABSTRACT

Uroperitonium is defined by the accumulation of urine in the abdominal cavity, mostly being generated by the rupture of the urinary gallbladder, affecting young foals. The clinical symptoms of the disease include apathy, dyspnea, tachypnea, abdominal distension, discomfort and can cause death due to imbalance due to intense uremia. The diagnosis is made through complementary tests, together with the clinic. Complementary tests include abdominal ultrasound and laboratory tests, such as: blood count, biochemistry, analysis of abdominal fluid and urinalysis. The prognosis is poor and depends on the clinical evolution and degree of contamination. The objective of this study is to report a case of uroperitonium in a female neonate, received at the Unifeob Veterinary Center, presenting dyspnea, hyperthermia, apathy and abdominal discomfort. Complementary tests were of paramount importance for the final diagnosis. Due to the time of evolution associated with the severe degree of contamination, the patient died before the surgical intervention.

Keywords: Neonatology, Ultrasonography, Uremia.

INTRODUCTION

Uroperitonium is defined by the concentration of urine in the abdominal cavity, and is predominantly caused by the rupture of the urinary vesicle (Aguilar, 2019). Urine retention in the peritoneal cavity is one of the urogenital conditions that affect young foals, being detected in up to 2.5% of hospitalized neonates (Kablack et al., 2000).

Most of the published studies on uroperitonium describe the urinary gallbladder defect as the main cause, and only a few studies describe the primary urachal defect as the cause of the pathology, both in horses and in other animals (Muller, Gregory, 1978; Baxter et al., 1992; Braunet al., 2009).

The manifestation of the disease occurs more frequently in male foals after birth (Bain, 1954). The frequent occurrence in male foals is related to the wider urethra and narrower lumen, which compromises proper emptying of the bladder. The anatomical difference makes males more susceptible to complete bladder rupture when subjected to the focal pressures of labor (Bain, 1954; Rooney, 1971; Hackett, 1984).

The dorsal region of the bladder wall is the most common site for rupture to occur, with the urachus being the second most affected structure (Hackett, 1984; Adams, 1988). Among the various causes that can result in abdominal pain in the neonate, uroperitonum can be considered the earliest (Souza, Sacco, Pereira, 2008). Its manifestation is possible in the first days of life due to the compression of the bladder and the traction of the umbilical cord during childbirth, which causes traction and, in some cases, leads to the rupture of the urachus (Gomes et al., 2022). Symptoms in newborn animals include weakness, difficulty suckling, dysuria, dyspnea, hypovolemia, tachycardia, tachypnea, metabolic and respiratory acidosis due to considerable abdominal distension caused by urine accumulation. This can result in signs of intoxication, stupor, coma, and eventual death due to uremia (Thomassian, 2005).

Uroperitonium may result in a large volume of peritoneal anechogenic fluid, containing echogenic calcium carbonate crystals. Visceral structures may be delimited by anichogenic fluid and the urinary vesicle may be seen folded and collapsed, however, this lesion is not often visualized (Kidd, Lu, Frazer, 2022).

Patients with uroperitonium may present with leukocytosis with neutrophilia (> 15,000/mL) and metabolic acidosis. Presenting high levels of urea and creatinine, mostly above 66 mg/dL and 4.1 mg/dL (Thomassian, 2005).

One of the most sensitive laboratory tests for diagnosing uroperitonium is the relationship between creatinine levels in peritoneal fluid and blood serum. To confirm the diagnosis, the ratio of creatinine concentration in abdominal fluid to serum must be 2:1 or greater (Thrall et. al., 2015).

The concentration of urine in the abdominal cavity causes it to have high concentrations of creatinine and potassium, being low in sodium, thus leading to an increase in the osmolarity of the

peritoneal fluid (Butters, 2008). The accumulation of creatinine in the peritoneal fluid evolves into chemical peritonitis, first leading to the release of vasoactive and chemotactic amines, thus increasing vascular and plasma permeability (Knottenbelt, Holdstock, Madigan, 2004). In addition to the fact that inflammatory diseases can develop a systemic inflammatory response (SIRS), defined by a dysfunction caused by a dysregulated inflammatory response of the host to infection, the symptoms may involve: leukocytosis or leukopenia, tachycardia, tachypnea, and fever (Melo et. al., 2021).

Celiotomy is considered the resolutive intervention, and should be performed when the patient is stabilized (Thomassian, 2005).

The surgical procedure is performed with a midline incision, identification of the structures involved, inverted suture in the urinary gallbladder and the abdomen must be washed. The residual part of the umbilical tissue is removed, the placement of a drain may be an option. The prognosis is directly related to the degree of contamination present (Du Plessis, 1958; Adams, 1988; Richardson, 1983).

The objective of this study is to report the case of uroperitonium due to urachal rupture in a filly, pointing out the alterations found in the diagnostic methods of the disease and its complications.

CASE REPORT

A filly, quarter horse, approximately 4 days old, was referred to the Unifeob Veterinary Center, in São João da Boa Vista-SP, presenting in the clinical examination: heart rate 144 bpm, respiratory rate 128 mpm, dyspnea, prostration, abdominal discomfort, hyperthermia 40.7°C, normocored mucous membranes, blood lactate 16.0 mmol/L, glycemia 345 mg/dL.

To correct the electrolyte imbalance and minimize potassium concentration, fluid therapy with isotonic saline solution, intravenous administration of dipyrone for temperature control, hydrocortisone 4 mg/kg (single dose), as a cephalosporin antibiotic with bactericidal activity against gram-negative and gram-positive bacteria was used, ceftiofur 10 mg/kg BID and selective anti-inflammatory for cox-2, firocoxib 0.2 mg/kg SID for control of inflammation.

Complementary tests were performed on a complete blood count (Table 1), a biochemical test (Table 2), and abdominal and thoracic ultrasound. In the blood count, it was possible to observe an evident leukocytosis due to neutrophilia and monocytosis, in addition to changes in biochemistry, especially in renal functions (urea and creatinine). Abdominal ultrasonography evaluated the presence of free fluid in the abdomen with fibrinous cellularity (Figure 1), fluctuating urinary vesicle wall (Figure 2), slender voids with a rough wall. On thoracic ultrasound, no significant pleural alteration.

For the laboratory analysis of the free fluid present in the abdomen (Table 3), ultrasound-guided abdomenycosis was performed (Figure 3), thus providing greater safety in the collection, concomitantly, urethral probing was performed to collect urine (Table 4) and compatibility analysis between the samples. It was noted that there was a great compatibility between both, odor, density, pH, color, and a large presence of red blood cells.

The compilation of laboratory and ultrasound findings led to the diagnosis of uroperitonium, with emergency surgical referral. Until the arrival of the surgical staff, the patient in question had an evident clinical worsening, presenting dyspnea, tachypnea and cyanotic mucosa (at which time hydrocortisone was administered), the patient was in intensive oxygen therapy. The patient died during anesthetic induction, before intubation, due to its severe degree of contamination, leading to septicemia and systemic inflammatory response.

TABLE 1: Complete blood count, showing leukocytosis.

Material: Sangue Total								
Equipamento: Bioquímico BIOPLUS 200							Vlr. de Referência	
Eritrograma								
Eritrócitos	8,19	milhões/mm³			7,40	a	10,60	
Hemoglobina	11,10	g/dl			10,70	a	15,80	
Hematócrito	29,20	%			28,00	a	43,00	
RDW	17,50	%			15,00	a	21,00	
V.C.M	35,65	u³			35,00	a	44,00	
H.C.M	13,55	pg			0,00	a	0,00	
C.H.C.M	38,01	g/dl			35,00	a	40,00	
Proteína total	6,60	g/dl			6,20	a	7,50	
Eritroblastos	0,00	%						
Observação série vermelha:								
Leucograma					Vlr. Ref. Relativo		Vlr. Ref. Absoluto	
Leucócitos	38000			/mm³			6300 a 13600	
Mielócitos	0	%	0	/mm³	0-0	%	0 a 0	
Metamielócitos	0	%	0	/mm³	0-0	%	0 a 0	
Bastonetes	0	%	0	/mm³	0-1	%	0 a 240	
Segmentados	85	%	32300	/mm³	69-77	%	4350 a 10550	
Eosinófilos	0	%	0	/mm³	0-0	%	0 a 90	
Basófilos	0	%	0	/mm³	0-1	%	0 a 180	
Linfócitos típicos	4	%	1520	/mm³	22-16	%	1430 a 2280	
Linfócitos atípicos	0	%	0	/mm³	0-0	%	0 a 0	
Monócitos	11	%	4180	/mm³	4-3	%	300 a 540	
Outros	0	%	0	/mm³				
Observação série branca:								
Contagem plaquetária	327000	mil/mm³					100000 a 350000	
Avaliação plaquetária								

Source: Authors, 2024.

TABLE 2: Results of the biochemical examination.

Albumina

Material: Soro
Metodologia: Verde de Bromocresol
Equipamento: Bioquímico BIOPLUS 200

			Valores de Referência		
Resultado.....:	2,10	g/dL	2,00	a	3,50

Creatinina

Material: Soro
Metodologia: Cinético Colorimétrico
Equipamento: Bioquímico BIOPLUS 200

			Valores de Referência		
Resultado.....:	11,30	mg/dL	1,00	a	1,70

Uréia

Material: Soro
Metodologia: Cinético UV
Equipamento: Bioquímico BIOPLUS 200

			Valores de Referência		
Resultado.....:	201,00	mg/dL	4,00	a	20,00

AST

Material: Soro
Metodologia: Cinético UV
Equipamento: Bioquímico BIOPLUS 200

			Valores de Referência		
Resultado.....:	291,00	UI/L	200,00	a	450,00

Fibrinogênio

Material: Plasma
Metodologia: Precipitação em banho maria
Equipamento: Bioquímico BIOPLUS 200

			Valores de Referência		
Resultado.....:	400,00	mg/dL	100,00	a	400,00

Source: Authors, 2024.

TABLE 3: Results of the urinalysis test, urinalysis.

Urina			Referência		
Material: Urina					
Exame Físico					
Método de Obtenção	Cateterismo				
Volume	6,00	mL			
Cor	Amarelo Palha				
Aspecto	Límpido		Límpido		
Densidade	1010	g/ml	1020	a	1050
Exame Químico					
pH	7,00		7,00	a	8,00
Bilirrubina	Ausente		Ausente		
Urobilinogênio	Normal		Normal		
Proteínas	++		Ausente a Traços		
Glicose	+++		Ausente		
Corpos Cetônico	Ausente		Ausentes		
Sangue Oculto	++++		Ausente		
Nitrito	Negativo		Negativo		
Sedimentoscopia					
Hemácias	Campo Cheio		Até 2/campo		
Leucócitos	6-20		Até 3/campo		
Células					
Descamativa	Algumas		0 a +		
Transição	+		0 a +		
Outros					
Cilindros			Ausentes		
Cristais			Ausentes		
Outros Elementos	Odor: Sui generis. Sais biliares: Ausente.				

Source: Authors, 2024.

TABLE 4: Results of the analysis of free fluid, collected via the abdomenyx and ultrasound-guided procedure.

Exame Físico

Volume: 1,5ml
Cor: Amarelo Palha
Odor: Fermentado
Aspecto: Límpido
Densidade: 1.010,0

Exame Químico

pH: 8,0
Proteínas: 0,0 mg/dL
Glicose: +++
Sangue Oculto: +

Contagem

Hemácias: 10.000
Leucócitos: 800

Citologia %

Neutrófilos: 10%
Linfócitos: 0
Bastonetes: 0
Macrófagos: 90%
Eosinófilos:0

Observações

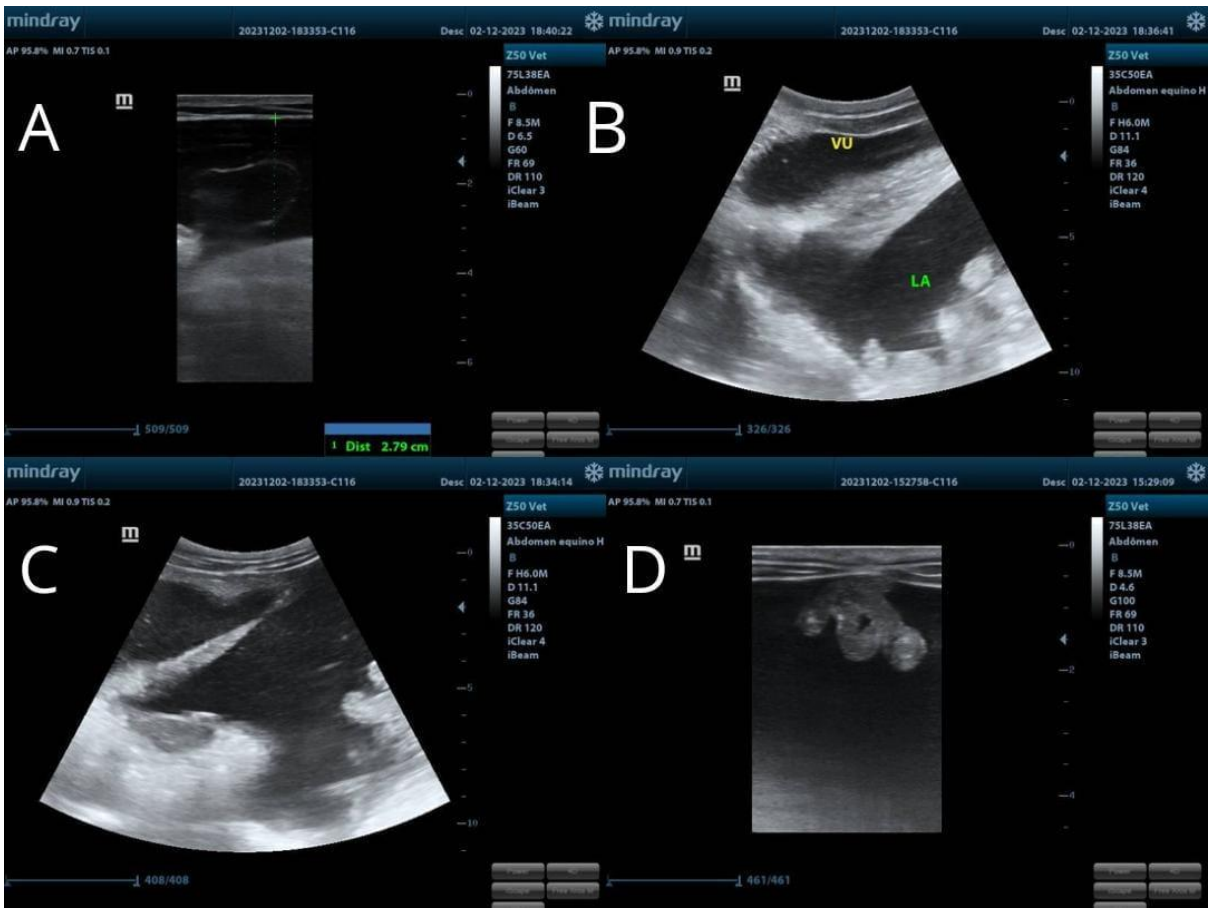
Foi realizado bioquímico do liquído, com os seguintes resultados:
Creatinina: 22,7 mg/dL
Albumina: 0,0 g/dL

Amostra

Tipo de coleta: Abdominocentese
Qualidade da amostra: Satisfatória

Source: Authors, 2024.

Ultrasound images: **A)**: Showing the presence of free fluid in the abdominal cavity and measuring the distance between the muscles and intestinal loops, thus collecting the fluid guided by ultrasound. Using linear probe, with frequency at 8.5MHz **B)**: VU: Urinary gallbladder. LA: Abdominal fluid. Using a linear probe, with harmonic frequency 6.0MHz **C)**: Subsequent image, showing communication between urinary vesicle and free fluid, through the floating wall between them. Using linear probe, with harmonic frequency 6.0MHz **D)**: Urace, vein and floating umbilical arteries. Using linear probe, with frequency at 8.5MHz.



Source: Authors, 2024.

CONCLUSION

According to the present study, it is possible to conclude that even if uroperitonum due to urinary gallbladder rupture in females is poorly described, it may occur. Information from complementary exams, both ultrasonography and laboratory tests, added to the clinic are essential for a quick and accurate diagnosis. As described, the evolution time is crucial for the prognosis of the disease, so having tests that help us for the diagnosis, consequently we reduce the clinical evolution time of the disease, thus helping patients suffering from such a disease.

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Pathophysiology of heart failure and its relationship with interleukin - 1β sST2 receptors

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Felipe Gustavo Morais Menegassi[1]

ABSTRACT

Objective: to establish, through a narrative-critical review, the pathophysiology, prevalence, diagnosis and therapeutic management of heart failure (HF). It also demonstrated the association of HF with cardiovascular biomarkers, such as interleukin 1β and its receptors. Methods: literature review based on scientific articles from the PubMed, LILACS and SciELO databases. Descriptors based on studies published in the years 2014 to 2023 and adherence to the theme "heart failure" were used. Studies without complete publications and without free availability on the data platform were excluded. Results: 204, 22 and 6 articles were obtained from the PubMed, LILACS and SciELO databases, respectively. Of these, 18, 2 and 2 articles from PubMed, LILACS and SciELO, respectively, stood out after evaluation and use of exclusion criteria. Finally, 17 articles and a textbook make up this study. Conclusion: HF is a syndromic pathology caused by a series of different etiological diagnoses. Patients with HF have several compensatory mechanisms, in addition to occasional cardiac remodeling and repair guided by inflammatory mediators. In this disease, biomarkers are very useful, being widely studied in recent years. An important highlight is the 1β interleukins, which are useful in the diagnosis and therapeutic management of HF.

Keywords: Heart Failure, Interleukin 1, sST2 Receptors.

[1] Intensive Care Specialist Institution: Brazilian Ministry of Health
E-mail: moraisfelipe029@gmail.com

INTRODUCTION

Heart failure (HF) encompasses a series of clinical signs and symptoms originating from a series of different etiological diagnoses. It is difficult to establish this diagnostic identity as a specific disease. Therefore, HF can be considered as a syndromic finding originating from several distinct pathophysiological findings. In the scientific literature it is possible to find many definitions for heart failure. This happens due to the scope that each definition comprises in itself and the need to meet the demand of each clinical practice. Some definitions are focused on urgency and emergency guidelines, others are focused on their pathophysiology, and there are still others that are stricter to traditional medical school textbooks (HEIDENREICH et al., 2022; CANDICE and KOLODZIEJ, 2019).

According to the American College of Cardiology Foundation (2021), heart failure is a syndromic finding. HF results from any damage caused to the ventricular structure or function or damage during blood ejection. The fundamental symptoms of HF are dyspnea, edema, and fatigue. These symptoms have a relevant impact on tolerance to physical activity and fluid retention. It is common to find patients with pulmonary congestion and edema of the upper and lower limbs. The list of patients who report intolerance to physical exercise, but do not have peripheral fluid retention, is also classic (BOZKURT et al., 2021).

Many textbooks portray HF as a state where the heart cannot pump blood in the minimum amount necessary to maintain body homeostasis. According to this definition, in HF, many organs are unable to receive adequate oxygen supply to maintain many body functions. Therefore, constant fatigue, dyspnea, and intolerance to physical activity are justified. Although these books provide a clear definition of HF, this definition cannot reach all types of patients. This is the deficiency in this type of scientific literature (HEIDENREICH et al., 2022).

METHODS

The study prepared in this literature review was based on data obtained from bibliographic searches carried out in the PubMed, LILACS and SciELO databases. To obtain the articles, the following descriptors were defined: heart failure, interleukin 1 and sST2 receptors. Through PuBMed, LILACS and SciELO, 204, 22 and 6 articles were obtained, respectively. All according to the following search plan: heart failure AND interleukin 1 OR sST2 receptors (Heart Failure AND Interleukin 1 OR sST2 receptors). The selection criteria were adopted: publication in 2013 and 2023 and adherence to the theme "heart failure" as a minimum prerequisite for the study. Thus, 85, 9 and 0 articles were excluded, respectively. Of these, articles that were not freely available to the scientific community were disregarded. Finally, 69, 2 and 6 articles, respectively, were collected for analysis. 18 articles from PubMed, 2 articles from LILACS and 2 articles from SciELO were selected for

further analysis. In view of the heterogeneity of the articles, an explanatory/descriptive analysis was established with a subsequent narrative-critical review of the pertinent studies.

RESULTS AND DISCUSSION

The bibliographic study generated 22 articles. In view of these results, explanatory-descriptive analyses of all selected studies were performed. After evaluation and review of the findings, 17 articles and one textbook were highlighted to support the development of this literature review.

According to the European Society of Cardiology (2016), HF is a clinical syndrome consisting of dyspnea, swelling and fatigue. In addition to these symptoms, some specific signs may occur, such as: elevated jugular venous pressure, pulmonary crackles, and peripheral edema. The European Society of Cardiology also refers to HF as resulting from damage to cardiac structure and functionality that leads to cardiovascular incompetence in maintaining organic homeostasis (BOZKURT et al., 2021).

According to the Japanese Heart Failure Society (2017), HF is a clinical syndrome formed by dyspnea, malaise, swelling, and intolerance to physical activity due to cardiac incompetence, but specifically in the blood ejection pump (BOZKURT et al., 2021).

There is also a subclassification of HF according to left ventricular ejection fraction (LVEF). This classification is based on guidelines and protocols shaped by the clinical practice of many health services. According to the guideline of the American College of Cardiology and the American Heart Association (2022), heart failure can be subdivided into: HF with reduced ejection fraction or HFrEF; CI with improved ejection fraction or HFmEF; CI with intermediate ejection fraction or HFi (some authors also consider it CI with slightly reduced ejection fraction or HFler) and CI with preserved ejection fraction or HFpEF. The classification criteria are based on the capacity of blood ejection through the left ventricle. When LVEF $\leq$ 40%, HFrEF is indicated; Previously LVEF $\leq$ 40% that improved after medical follow-up is called HFmHF; LVEF between 41% and 49% is HFiEF or HFLER and LVEF $\geq$ 50% represents HFp (HEIDENREICH et al., 2022; CORREIA AND MESQUITA, 2022).

PREVALENCE OF HEART FAILURE

With technological improvement and the emergence of new therapeutic approaches, there has been an increase in life expectancy and a reduction in mortality from heart disease. However, there is still a high morbidity and mortality related to HF. LVEF is considered an important evaluator of ventricular disorder, prognosis, and mortality in HF patients. With the advancement of science in recent decades, there has been an improvement in the therapeutic approach to patients with cardiovascular diseases. New drugs have increased the treatment of HF. In addition, several

implantable cardiac devices have been created and new therapeutic guidelines for cardiovascular diseases have been improved, especially HF (WYBRANIEC et al., 2022).

The prevalence of heart failure in the adult world population is approximately 2%. However, in the elderly over 80 years of age, this prevalence can reach 20% of the population. Regardless of its etiology, HF has an unfavorable prognosis, with mortality of approximately 50% of patients in 5 years of disease activity. The morbidity and mortality of HF is high and occurs in all forms of LVEF. Both the HFr and HFRLER and the HFmEFm and HFp. The prognosis of patients with HFrEF tends to be worse than the prognosis of patients with HFler. Comorbidities, such as systemic arterial hypertension, diabetes, dyslipidemia, and obesity are factors that contribute to the worsening of patients' prognosis (CORREIA AND MESQUITA, 2022; WYBRANIEC et al., 2022).

Despite advances in HF therapy over the past few years, there has been little impact on the clinical outcome of patients with HFpEF compared to patients with HFrEF. ICFEm, on the other hand, emerged especially due to advances in the treatment of these patients. That is, many patients migrated from the classification of HFrEF to HFmEF after follow-up and therapeutic success. It is worth noting that with the emergence of this new classification, there was a good reduction in the mortality of these patients. Patients who improved their clinical condition and migrated to HFmEF had approximately a 50% reduction in morbidity and mortality and a decrease in hospitalization, which did not occur with patients with HFrEF and HFp (WYBRANIEC et al., 2022).

NEUROHORMONAL MECHANISMS

When cardiac competence begins to reduce and the patient enters the clinical picture of HF, the body begins to try to readjust its homeostasis with the creation of compensatory mechanisms. Many of these mechanisms are classified as neurohormonal. Among the most well-known mechanisms are the activation of the sympathetic nervous system and the renin-angiotensin-aldosterone system. At first, these readjustments established by the body lead to a cascade of adaptations in various organs and systems. Organs such as the heart, lungs, kidneys, and liver acquire new functions to try to maintain homeostasis at adequate levels. However, over time, these new functions end up consuming a lot of the reserves of these organs, leading them to hemodynamic stress and important structural and functional disorders. The prognosis of HF can be inferred through the analysis of the mechanisms of neurohormonal activation. This concept is widely used in the field of pharmacology with a therapeutic scope of HF (HARTUPEE and MANN, 2017).

There are baroreceptors located in blood vessels such as the carotid sinus and the aortic arch. These baroreceptors have the function of evaluating pressure variations and other information. These receptors carry these notifications to the cardiovascular vasomotor centers located in the brainstem. When there is a cardiac disorder with LVEF involvement, the baroreceptors perceive this information

and pass it on to the central nervous system. In addition to these receptors, there are also chemoreceptors and ergoreceptors, which also play a relevant role in the adaptation of cardiovascular homeostasis (COSTANZO LS, 2015; HARTUPEE AND MANN, 2017).

In patients who do not have HF, the baroreceptors located in the carotid sinus and the aortic arch, together with the mechanoreceptors located in the heart and lungs, carry information to the central nervous system related to blood pressure and blood flow. This exchange of information occurs in a physiological way. In HF patients, there are disturbances in blood pumping, with consequent alteration of blood flow. It is worth remembering that mechanoreceptors can be subdivided into Pacini corpuscles (responsible for vibration and percussion), Meissner corpuscles (responsible for velocity), Ruffini corpuscles (responsible for pressure) and Merkel disks (responsible for localization) (COSTANZO LS, 2015; HARTUPEE AND MANN, 2017).

Patients with the onset of heart failure have several compensatory mechanisms, such as: sympathetic nervous system (SNS) and renin-angiotensin-aldosterone (RAAS). In addition to these and other mechanisms, occasional cardiac remodeling and repair occur in the body of these patients guided by inflammatory mediators. These and other actions aimed at maintaining homeostasis are classified as neurohormonal activation. Among the most well-known neurohormones, norepinephrines and angiotensin II, produced by various tissues, including the myocardium, stand out. However, the constant demand for these compensatory mechanisms and inflammatory mediators can lead to deleterious actions in the body. This constant damage can also be considered one of the etiologies of HF (HARTUPEE and MANN, 2017).

The renin-angiotensin-aldosterone system is a compensatory mechanism that has several receptors. Two relevant angiotensin II receptors are: AT1R and AT2R. The first receptor is responsible for several cardiovascular outcomes. Among them: arterial and venous vasoconstriction, sodium retention and potassium release, aldosterone release, cardiovascular repair and hypertrophy, and inflammatory mediation. The second receptor, AT2R, has an uncertain function, however, many authors have already proven its inhibitory activity in relation to AT1R. AT1R and AT2R are known to be G-protein-adhered transmembrane receptors. While AT1R is abundant in the human body, AT2R is found in small amounts. However, this second receptor can increase greatly in specific pathological conditions, such as: arterial hypertension, acute myocardial infarction and atherosclerosis (FARIA-COSTA et al., 2014).

HF sufferers develop high chemosensitivity to hypoxia and hypercapnia. In addition, these patients have intense sensory disturbance related to muscle metabolism during physical activity. Intense neurohormonal activation, deficit in functional capacity, and increased morbidity and mortality are directly related to increased chemosensitivity. This short-term neurohormonal activation helps maintain cardiovascular homeostasis. However, in the long term, this neurohormonal attempt to

maintain cardiac output in normal patterns leads to destruction of cardiac tissues and irreversible cardiovascular disorders (HARTUPEE AND MANN, 2017).

It is important to emphasize that the current therapeutic approach is based on studies of neurohormonal mechanisms and their developments. Pharmacology has developed a lot in recent years and with it the understanding of the relevance of the antagonism of neurohormonal systems as a therapeutic basis and improvement of the prognosis of heart failure. Very high levels of neurohormones in patients with long-term HF cause structural and functional damage to the heart, much of it irreversible. Due to advances in the treatment of HF, many patients with HFrEF achieve clinical improvement and are later considered patients with HFmEF (HARTUPEE AND MANN, 2017).

HOSPITAL PROGNOSIS OF HEART FAILURE

Heart failure has a relevant impact on the world economy, being responsible for a high consumption of public coffers. This syndromic finding has a high rate of demand and morbidity and mortality in the global health system. In addition, HF increases the length of hospital stay and is directly responsible for the increase in demand for hospital care and readmission. Many authors have already proven in several studies the impact that HF has on the follow-up and prognosis of hospitalized patients (DAVISON et al., 2016).

In a study carried out in 17 countries (USA, Canada, Israel, Belgium, France, Germany, Italy, Netherlands, Sweden, United Kingdom, Czech Republic, Hungary, Poland, Romania, Ukraine, Argentina and Russia) Davison et al. (2016), analyzed 1849 patients within 30 days of hospitalization with hospital discharge and 1902 patients within 90 days after hospital discharge with death outcome. In the study, of 1849 patients hospitalized within an interval of up to 30 days, with hospital discharge, 372 were readmitted to hospital services. Of these, 182 patients were hospitalized for complications directly related to HF. Of the 1849 patients, 45 died during the study. Regarding the 1902 patients discharged from hospital, 153 had a death outcome within 90 days of discharge. The most common risk factors for increased mortality rates were advanced age, obesity, hypertension, diabetes, leukocytosis, reduced sodium and bicarbonate, among others (DAVISON et al., 2016).

SURGICAL APPROACH IN HEART FAILURE

According to Falls and Kolodziej (2019), HF accounts for approximately 3% of the budget foreseen for health in the United States. Many pharmacological treatments have been developed in recent years for the management of HF. However, the eventual need for surgical approach in patients was seen as a complementary treatment for this pathology.

HF can occur at the systolic and/or diastolic level. Systolic heart failure can lead to irreversible myocardial disorders. This diagnostic identity can lead to symptoms refractory to drug therapy, increased intolerance to physical exercise, and increased demand for care in health units. In these cases, the surgical approach, such as heart transplantation or insertion of mechanical circulatory support devices may be more effective measures (FALLS and KOLODZIEJ, 2019).

In the scientific literature, many findings corroborate the idea that congestive exacerbation is closely associated with intense demand for health services. Therefore, congestion management in these patients, i.e., preload management, is one of the therapeutic goals targeted by healthcare professionals. Afterload is also evaluated and treated in HF patients through some classes of antihypertensive drugs. Drugs such as angiotensin-converting enzyme inhibitors (ACEIs), angiotensin receptor blockers (ARBs), beta-blockers, angiotensin/neprilysin receptor inhibitors (INRA) are drugs recommended by the American Heart Association, with a class I recommendation grade. heart transplantation (FALLS and KOLODZIEJ, 2019).

HEART TRANSPLANT

This therapeutic measure is adopted after failure in the face of the use of drugs recommended by international guidelines and protocols. Studies have shown that after 5 years of follow-up of HF in patients with advanced clinical conditions, 80% of patients die. This corroborates the need for a surgical approach in some cases. One of the surgical approaches is heart transplantation. This is considered the gold standard in the treatment of HF at an advanced stage. It is worth remembering that in the United States, 4,111 heart transplants were performed in 2022, 3,818 in 2021, 3,658 heart transplants in 2020 and 3,552 in 2019. The survival rate of heart transplantation in the first year is greater than 80% and after 5 years it is greater than 70% (FALLS and KOLODZIEJ, 2019; UNOS, 2023; WILHELM, 2015).

INDICATIONS FOR HEART TRANSPLANTATION

Before seeking heart transplantation, some therapeutic measures may be intended. Despite drug therapy or the use of other cardiac surgeries, if there is still therapeutic failure, heart transplantation can be used, taking into account some indications. Among these indications, the following can be highlighted: patients using beta-blockers with oxygen consumption less than or equal to 12ml/kg/min or 14ml/kg/min without using this medication; patients with ischemic disease and angina refractory to medical therapies where revascularization is not recommended; patients with advanced heart failure without drug improvement; patients with advanced HF without improvement with insertion of mechanical circulatory support devices; patients in functional class III or IV; patients in a 6-minute walk test of less than 300 meters (MANGINI et al., 2015).

CONTRAINDICATIONS TO HEART TRANSPLANTATION

Given the need for heart transplantation, it is necessary to evaluate the possible risks of surgery. There are some factors that contraindicate the surgical approach. Some conditions or comorbidities are impediments to this therapy. Among them, it is worth highlighting: severe lung disease, severe cerebrovascular diseases, severe peripheral arterial obstructive diseases, pulmonary arterial hypertension, severe psychiatric disorders, severe liver disease, psychoactive drug abuse, failure to adhere to treatment, and incompatibility between the recipient and the organ donor (MANGINI et al., 2015).

COMPLICATIONS IN CARDIAC SURGERIES

There are complications that can arise in heart surgery. Approximately 30% of patients may develop atrial fibrillation (AF) in the postoperative period of these procedures. When this occurs, it is important to keep in mind the therapeutic need of this event. In postoperative AF, the therapeutic goal becomes the control of heart rate and rhythm. AF has a relevant impact on patients with heart failure. Thus, many protocols recommend heart rhythm control in patients who have both comorbidities: AF and HF. According to Yang et al. (2021), in a randomized study with a therapeutic approach to postoperative AF in cardiac surgeries, where heart rate and rhythm control was managed, the need for therapeutic association with other treatment strategies was perceived in a large number of patients. In view of these findings, great relevance was perceived in the continued medical evaluation of hospitalized patients. It was also possible to notice the impact on the reduction of medical prescription of anticoagulants at hospital discharge. Patients with HF who were initially approached for heart rhythm control required a shorter time to achieve sinus heart rhythm, and were discharged from the hospital in better conditions (YANG et al., 2021).

Heart failure often predisposes its patients to atrial fibrillation due to a number of factors intrinsically associated with the two pathologies. Among the shared mechanisms and the specific pathophysiology of each one, the following can be listed: chronotropic incompetence; neurohormonal activation system; tachycardia-induced cardiomyopathy; inflammation at a systemic level; endothelial dysfunction; feeding of the renin-angiotensin-aldosterone system; attriventricular remodeling with gradual mitral and tricuspid regurgitation and natriuretic peptide circulation disorders. There are also risk factors common to both diagnostic identities: systemic arterial hypertension; obesity, aging, diabetes, dyslipidemia, and obstructive sleep apnea syndrome (KOTECHA et al., 2016; YANG et al., 2021).

ISCHEMIC CARDIOMYOPATHY AND HEART FAILURE

Heart failure is intrinsically related to ischemic cardiomyopathy. HF acts leading to long-term left ventricular diastolic dysfunction. In the onset of coronary artery disease (CAD), ischemic cardiomyopathy can lead to HF if not properly managed. Scenarios of myocardial weakening, cardiac tissue necrosis, or loss of cardiac contractility competence can lead to disturbances of left ventricular functionality. Despite the clinical picture of ischemic cardiomyopathy, patients with this diagnostic identity may have several signs and symptoms of HF. Despite the therapeutic advance in cardiovascular diseases, HF still presents several challenges to be overcome by the scientific community (DEL BUONO at al., 2022).

According to Del Buono et al. (2022), ischemic cardiomyopathy is the most common cause of heart failure in the population. The correct therapeutic management of ischemic cardiomyopathy helps to reestablish blood support to the cardiac tissue and, consequently, reduces the eventuality of HFrEF. With the updating of therapeutic measures, new approaches have been established, including the inflammatory modulation of patients with ischemic cardiomyopathy. However, there is still a great lack of information regarding the best conduct to advance the prognosis and quality of life in these patients.

INTERLEUKIN sST2 RECEPTORS - 1β

Among the most relevant markers in HF, interleukins 1 beta (IL-1β) stand out. These ILs are generated by macrophages as protein molecules that mediate relevant inflammatory processes in the cardiovascular system. There are IL alpha and beta with several important biological activities. IL-1β are cytokines initially generated in their non-activated forms. These ILs are subsequently activated by caspases

1 (CAPS1 / interleukin-converting enzymes 1) in its pro-inflammatory protein forms. In addition to inflammatory activity, there is also a relationship between these cytokines and cell growth, cell development, and apoptosis. An effective treatment currently carried out occurs with the programmed inhibition of these inflammatory cytokines. This inhibition occurs with the use of receptor antagonists for these ILs. An example is the use of Anakinra, a drug that antagonists inflammatory activity at the cardiovascular level that helps reduce cardiac disorders, reduce hospital admissions, decrease cardiac remodeling after ischemic events, improve physical fitness and cardiorespiratory fitness (BAYES-GENISet al., 2022).

Many heart cells, including cardiomyocytes and cardiac fibroblasts, produce cytokines in response to any damage caused to heart tissue. An important cytokine, interleukin 1 plays an important role in this process. This interleukin has a type 1 receptor known as ST2 or Tumorigenicity Suppression 2 which has several subgroups such as soluble ST2 (sST2) and ligand ST2 (ST2L).

These receptors are formed as a result of a series of damages to the cardiovascular system (BAYES-GENISet al., 2022; VILLACORTA and MAISEL, 2016).

In patients with heart failure, both soluble ST2 and IL-1 binding ST2 act actively, and the relationship of these receptors in cardiac remodeling and ventricular dysfunction has been proven. Many scholars have already proven the association between high concentrations of sST2 with fibrosis and cardiovascular stress. In other words, sST2 is an excellent predictor of cardiovascular outcomes in both chronic and acute HF, being a recent biomarker for use in medical practice. Interleukin 33 (IL-33), belonging to the interleukin 1 family, is also a ligand for ST2. This interleukin is not only expressed in the cardiovascular system, but also in other systems. sST2 works as a receptor with high affinity for IL-33. Thus, large amounts of sST2 influence the deleterious prognosis at the cardiovascular level (BAYES-GENIS et al., 2022; VILLACORTA and MAISEL, 2016).

In agreement with Villacorta and Maisel (2016), biomarkers are very useful in HF. It is already known that B-type natriuretic peptide (BNP) and N-terminal pro-B-type natriuretic peptide (NT-proBNP) are references in the diagnosis of heart failure, and are considered gold standard tests. However, these tests have no relevant prognostic value and cannot define the best therapeutic strategy alone.

Acute myocardial infarction (AMI) is also related to the elevation of cardiac biomarkers. Therefore, the increase in these markers alone is not enough to make a diagnosis of HF. Another cause of elevation of many cardiac biomarkers is recurrent physical stress. Therefore, the patient's anamnesis and clinical condition are always mandatory for diagnostic accuracy (MORAIS MENEGASSI et al. 2019).

CONCLUSION

Heart failure is a syndromic pathology caused by a series of different etiological diagnoses. It is not yet possible to determine this syndrome as a disease arising from a single pathophysiological finding. However, with technological advances, much has been achieved in the diagnostic and therapeutic management of this pathology. Patients facing the onset of HF have several compensatory mechanisms, in addition to eventual cardiac remodeling and repair guided by inflammatory mediators. These and other actions are classified as neurohormonal activation. Biomarkers, on the other hand, have been widely studied in recent years, play an important role in this study. Among the most important markers are interleukins 1 beta (IL-1β), created by macrophages as mediators of inflammatory processes in the cardiovascular system. Biomarkers are very useful, being a reference in the diagnosis of HF and important aids in its therapeutic management.

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Integrative theoretical model: Differentiating the processes of health and illness between civil, military and forensic police officers

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Marizangela Lissandra de Oliveira[1], Chiara Lubich Medeiros de Figueiredo[2], Kariza Lopes Barreto[3], Tamires Feitosa de Lima[4], Letícia de Souza Oliveira[5], Gabrielle Prudente e Silva[6], Luan dos Santos Mendes Costa[7], Francisco Thiago Carneiro Sena[8], Wanderley Pinheiro de Holanda Júnior[9], Renato Evando Moreira Filho[10], Caroline Mary Gurgel Dias Florêncio[11] and Raimunda Hermelinda Maia Macena[12]

ABSTRACT

Objective: To describe the concepts and stages of the construction of an integrative theoretical model and to systematize an integrative model differentiating the processes of health and illness between civil, military and forensic police officers. Methods: Integrative literature review with a search carried out in free virtual databases. Results: Development of a model based on the combination of elements from 15 theoretical models, offering a holistic view of the health and illness processes among civil, military and forensic police officers. This model takes into account three key elements, namely: Violence and Health; Illness at Work; Risk Work and Experiences with Violence. For each element of the model, 5 theories are described and their applications in the context of civil, military and forensic police work. Conclusion: An effective theoretical model must contain a holistic view of the health-illness processes and must integrate biological, psychological, social, and organizational factors that directly influence the well-being and mental health of these individuals.

Keywords: Police, Health, Illness, Theoretical model.

[1] Master's Degree, State University of Ceará
[2] Master's Degree Federal University of Ceará
[3] Master's Degree - Universidad del Pacific.
[4] Master's Degree Federal University of Ceará
[5] Graduation Federal University of Ceará
[6] Graduation Federal University of Ceará
[7] Graduation Federal University of Ceará
[8] Master's Degree Federal University of Ceará
[9] Master's Degree Federal University of Ceará
[10] Doctor Federal University of Ceará
[11] Doctor Federal University of Ceará
[12] Post-Doctorate Federal University of Ceará

INTRODUCTION

An integrative theoretical model is a powerful tool that allows for deep and comprehensive understanding of complex phenomena by combining multiple theories into a unified framework. This approach not only enriches theoretical analysis, but also has great potential for practical applications, helping to solve real problems more effectively and holistically. By considering different dimensions and variables, integrative models offer a complete and detailed view, facilitating the creation of more effective and comprehensive intervention strategies (Bronfenbrenner, 1979; Galtung, 1969).

The flexibility and adaptability of integrative models allow them to evolve as new information and theories become available, ensuring their continued relevance in dynamic research fields. In addition, internal coherence and the ability to integrate multiple perspectives make these models valuable tools for practitioners and policymakers seeking to understand and address complex problems (Lazarus & Folkman, 1984; Karasek, 1979).

The multidisciplinarity of integrative models is one of its greatest strengths, allowing a rich and detailed analysis of phenomena that cross various areas of knowledge. This is particularly useful in contexts where complex problems require varied and interdisciplinary approaches to be understood and solved effectively (Herman, 1992; Maslach & Jackson, 1981).

Finally, the ability to apply these models in real-world situations makes them extremely useful for policy creation and practical interventions. By providing a solid and comprehensive theoretical basis, integrative models help guide actions and decisions in varied contexts, from public health to education and security (Slovic, 1987; Wilkinson, 2001).

Therefore, an integrative theoretical model is essential for any field that deals with complex and multifaceted phenomena. By combining multiple theories into a unified framework, these models offer a deep and comprehensive understanding, enriching both theoretical research and practical application (Bakker & Demerouti, 2007; Wickens, 1992).

We will present below the key concepts, the steps for the elaboration of an integrative theoretical model and the proposition of an integrative theoretical model differentiating the processes of health and illness between civil, military and forensic police**.**

KEY CONCEPTS ABOUT INTEGRATIVE THEORETICAL MODEL

Integrative theoretical models are fundamental to face the complexity of the phenomena studied in contemporary scientific research. By bringing together diverse perspectives and disciplines, these models provide richer insights and more effective solutions, reflecting the multifaceted nature of real problems (Lazarus & Folkman, 1984; Karasek, 1979).

An integrative theoretical model is an approach that combines multiple theories or models into a coherent framework to offer a more comprehensive and holistic understanding of a complex

phenomenon. This methodology is particularly useful in areas where a single theoretical model is insufficient to explain all the nuances and variables involved (Slovic, 1987; Wilkinson, 2001).

CHARACTERISTICS OF AN INTEGRATIVE THEORETICAL MODEL

One of the main benefits of integrative theoretical models is their ability to incorporate perspectives from various disciplines, which allows for richer and more detailed analysis. These are characteristics of an integrative theoretical model (Slovic, 1987; Wilkinson, 2001; Bronfenbrenner, 1979; Lazarus & Folkman, 1984; Slovic, 1987; Masten, 2001):

- **Multidisciplinarity**: An integrative theoretical model often incorporates perspectives from multiple disciplines, allowing for richer and more detailed analysis.
- **Comprehensiveness**: By bringing together several theories, the integrative model seeks to cover all relevant aspects of the phenomenon in question. It offers a more complete view, contemplating different dimensions and variables that may be interrelated.
- **Holism:** Focuses on a global view, considering multiple factors and their interactions, rather than isolating specific variables.
- **Flexibility**: Integrative models are flexible and adaptable. They can be adjusted and expanded as new information and theories become available, allowing a continuous evolution of the understanding of the phenomenon studied.
- **Coherence**: Despite combining multiple theories, an integrative model must maintain internal coherence. The different parts of the model should complement each other and not contradict each other, creating a logical and cohesive structure.
- **Complexity**: Confronts the complexity of real phenomena, recognizing that many issues cannot be satisfactorily explained through a single theory.
- **Interactivity**: Encourages interaction between different fields of study, promoting interdisciplinary collaborations and knowledge exchanges.
- **Practical Applicability**: By integrating multiple perspectives, these models are often more applicable to real-world situations. They can provide practical guidelines for intervention, public policy, and management strategies in complex contexts.

This multidisciplinary approach allows for a more complete view of the phenomenon studied, considering different angles and interrelated factors (Bronfenbrenner, 1979; Lazarus & Folkman, 1984). In addition to being comprehensive, integrative theoretical models are designed to be flexible and adaptable. They can be adjusted and expanded as new information and theories become available, allowing for a continuous evolution of understanding of the phenomenon studied. This characteristic is fundamental in areas of dynamic research, where new discoveries can rapidly change the theoretical landscape (Herman, 1992; Galtung, 1969).

Another important aspect is the internal coherence of the model. Despite combining multiple theories, an integrative model must maintain a logical and cohesive structure, where the different parts of the model complement each other and do not contradict each other. This ensures that the approach is robust and reliable, providing a solid foundation for analysis and practical application (Karasek, 1979; Maslach & Jackson, 1981).

The practical applicability of integrative models is one of their greatest strengths. By integrating multiple perspectives, these models are often more applicable to real-world situations. They can provide practical guidelines for intervention, public policy, and management strategies in complex contexts, becoming valuable tools for practitioners and policymakers (Slovic, 1987; Masten, 2001).

Finally, the comprehensiveness of integrative theoretical models allows them to cover all relevant aspects of the phenomenon in question. By considering different dimensions and variables that may be interrelated, these models offer a complete and detailed view, allowing a deep and comprehensive understanding of the phenomenon studied (Wilkinson, 2001; Wickens, 1992).

In public health, integrative approaches are essential to address complex issues such as obesity. An integrative theoretical model can combine theories about eating behavior, genetics, socioeconomic environment, and health policies. This facilitates the creation of more comprehensive and effective strategies for the prevention and treatment of obesity, approaching the problem from multiple perspectives (Galtung, 1969; Wilkinson, 2001). In the area of mental health, integrative theoretical models can be particularly useful for understanding the mental health of individuals exposed to high levels of stress, such as police officers. An integrative model can combine theories of psychological trauma, occupational stress, resilience, and social support, allowing for a more complete understanding of the causes, consequences, and potential interventions for mental health problems (Herman, 1992; Karasek, 1979).

STEPS TO CREATE AN INTEGRATIVE THEORETICAL MODEL

In summary, 6 steps are needed to create an integrative theoretical model (Slovic, 1987; Wilkinson, 2001; Bronfenbrenner, 1979; Lazarus & Folkman, 1984; Slovic, 1987; Masten, 2001):

1) **Identification of the Phenomenon**: Clearly define the phenomenon or problem that will be studied.
2) **Literature Review**: Conduct an extensive literature review to identify existing theories that apply to the phenomenon.
3) **Theory Selection**: Choose the most relevant and complementary theories that together can provide a complete picture of the phenomenon.

4) **Integration of Theories**: Develop a model that integrates the concepts and hypotheses of the various selected theories. Make sure that the theories complement each other and do not contradict each other.
5) **Validation and Fit**: Validate the model through empirical research and adjust it as needed to improve its coherence and applicability.
6) **Practical Application**: Use the model to guide practical interventions, policies, and strategies in the context studied.

We will detail each of the steps below. The first step in creating an integrative theoretical model is to clearly identify the phenomenon or problem that will be studied. Defining the scope and objectives of the study is crucial to direct the literature review and the selection of theories to be integrated. For example, when studying the impact of violence on the mental health of police officers, it is necessary to delimit which aspects of violence and mental health will be focused on (Herman, 1992; Karasek, 1979).

Next, an extensive review of the literature should be conducted to identify the existing theories that apply to the phenomenon. This stage involves searching for academic articles, books, and other relevant materials that offer different perspectives on the topic. The literature review helps to map the theoretical terrain and identify the gaps that the integrative model intends to fill (Lazarus & Folkman, 1984; Maslach & Jackson, 1981).

The selection of the most relevant and complementary theories is the next step. It is important to choose theories that, together, can provide a complete and coherent view of the phenomenon. The selection must be judicious, considering the ability of theories to complement each other and to offer comprehensive explanations for different aspects of the problem (Bronfenbrenner, 1979; Galtung, 1969). After the selection of the theories, the model must be developed in order to integrate the concepts and hypotheses of the various selected theories. It is essential to ensure that theories complement each other and do not contradict each other, creating a logical and cohesive structure. This phase involves the construction of diagrams, schemes, and detailed descriptions that show how the different theories interrelate (Karasek, 1979; Slovic, 1987).

Finally, the model should be validated through empirical research and adjusted as necessary to improve its coherence and applicability. Empirical validation is key to ensuring that the model is robust and applicable to real-world situations. The model must also be continually revised and updated as new information and theories become available (Herman, 1992; Bakker & Demerouti, 2007).

THEORETICAL MODELS USEFUL IN THE ANALYSIS OF HEALTH AND ILLNESS PROCESSES AMONG CIVIL, MILITARY AND FORENSIC POLICE OFFICERS

Civil, military, and forensic police officers face different types of violence and risks in their daily activities, which significantly impacts their health and well-being. This integrative model differentiates these impacts, using 15 explanatory theoretical models grouped into three categories: violence and health, illness at work, and risk work and experiences with violence.

THEORETICAL MODELS ON VIOLENCE AND HEALTH

Theoretical models on violence and health aim to understand the complex interactions between individual, social, and environmental factors that contribute to the occurrence of violence and its impacts on health. These models often take an ecological approach, considering multiple levels of influence, from personal characteristics to community dynamics and public policies.

According to Krug et al. (2002), the World Health Organization (WHO) Ecological Model for the Prevention of Violence identifies four levels of risk: individual, relational, community and societal. Each level represents different factors that can contribute to violence, such as childhood trauma, conflicting interpersonal relationships, conditions of poverty, and cultural norms that legitimize violent behavior. By integrating these different dimensions, theoretical models allow for a more comprehensive analysis and facilitate the development of multisectoral interventions.

In addition to understanding the causes of violence, theoretical models also explore its effects on physical and mental health. Violence is recognized as a social determinant of health, contributing to a wide range of problems, from physical injuries and chronic illnesses to mental disorders such as depression and anxiety (Dahlberg & Krug, 2002).

Theoretical models, such as the Cycle of Violence Model, help explain how continued exposure to violence can perpetuate a cycle of trauma and violent behavior, exacerbating health problems over time. This model illustrates how violence experienced in childhood can lead to violent behaviors in adulthood, perpetuating an intergenerational cycle of violence and associated health problems.

Theoretical models on violence and health also emphasize the importance of early intervention and prevention. According to Heise (1998), interventions that address multiple levels of influence, from the promotion of individual coping skills to the implementation of effective public policies, are essential to reduce the incidence of violence and improve the health of the population. For example, community-based programs that promote safe environments and social supports can reduce risk factors associated with violence, while policies that aim to reduce economic inequality and improve access to basic resources can have significant impacts on violence prevention.

Finally, the integration of different disciplines in the elaboration of theoretical models on violence and health is crucial for a holistic understanding of the phenomenon. Collaboration between psychology, sociology, criminology, and public health allows for the creation of more effective and comprehensive intervention strategies. As noted by Wilkins et al. (2014), the multidisciplinary approach facilitates the identification of risk and protective factors in different contexts, promoting innovative and sustainable solutions to combat violence and its health impacts. The practical application of these theoretical models can, therefore, guide public health policies and intervention programs aimed at both preventing violence and mitigating its negative effects on the health of populations.

We will present below the theories that supported the construction of the integrative theoretical model, differentiating the processes of health and illness between civil, military and forensic police officers.

Psychological Trauma Theory (Herman, 1992) - Key concepts: Trauma, post-traumatic stress, resilience

Judith Herman (1992) proposed that exposure to violent events can result in profound psychological trauma, manifesting as post-traumatic stress disorder (PTSD) and other emotional disturbances. Trauma, according to Herman, fragments a person's sense of security and identity, resulting in emotional disorganization and difficulties with daily functioning.

The theory highlights the importance of proper recognition and treatment of PTSD to prevent the deterioration of the mental health of affected individuals. In addition, Herman points out that resilience can be a crucial protective factor, allowing some individuals to recover and adapt better after traumatic experiences. Resilience can be strengthened through social support, appropriate therapies, and interventions focused on rebuilding a sense of security and control.

- **Applications**:

1. Civil police officers who participate in operations against organized crime often develop symptoms of PTSD due to exposure to armed confrontations and extreme violence.
2. Military police officers in riot control units, often involved in riot control, may suffer flashbacks and nightmares stemming from intense confrontations.
3. Forensic police officers who analyze brutally violent crime scenes and victims may develop severe anxiety and insomnia due to constant exposure to disturbing images and situations.

Theory of Ecological Violence (Bronfenbrenner, 1979) - Key concepts: Microsystem, mesosystem, exosystem, macrosystem

Urie Bronfenbrenner (1979) developed the ecological theory of development, applicable to understanding violence at different levels of ecological interaction. Violence is seen as a phenomenon influenced by individual, relational, community and societal factors. Bronfenbrenner suggests that the environments in which people live and work have a significant impact on their development and mental health.

The ecological model highlights the complexity of violence and its ramifications on several levels. In the microsystem, domestic or interpersonal violence directly affects individuals, while in the exosystem, public security policies and working conditions indirectly influence levels of violence and stress. The macrosystem encompasses broader cultural and social factors that perpetuate structural violence.

- **Applications**:

1. Civil police officers in high-crime areas face the constant influence of community violence, impacting their mental health.
2. Military police officers in specialized units operating in urban conflict zones deal with multiple systems of violence, ranging from direct conflicts to broader social tensions.
3. Forensic police officers working in environments with high crime rates can be affected by the structural violence present in the community, exacerbating stress and anxiety.

Occupational Health and Stress Model (Karasek, 1979) - Key concepts: Work demand, work control, social support

Robert Karasek (1979) suggests that high levels of work demand combined with poor social control and support result in occupational stress and ill health. He argues that the relationship between these variables is crucial to understanding the well-being of workers.

Karasek's model proposes that workers with high demand and low control face a higher risk of stress and work-related illnesses. The theory highlights the importance of social support in the workplace, suggesting that colleagues and supervisors can play a significant role in mitigating stress. Additionally, Karasek emphasizes the need to increase workers' control over their tasks and decisions, which can lead to a better balance between demand and responsiveness.

- **Applications**:

1. Civil police officers in investigative units face high work demands and pressure to solve complex cases, often with little control over available resources.
2. Military police officers in tactical operations have high physical and emotional demands, with little control over operating conditions.

3. Forensic police officers who work with tight deadlines for evidence review can experience extreme stress due to the constant pressure and lack of adequate support.

Broken Window Theory (Wilson & Kelling, 1982) - Key concepts: Urban disorder, criminality, maintenance of order

James Q. Wilson and George Kelling (1982) have proposed that visible signs of disorder and abandonment, such as broken windows, encourage criminal behaviors and increase violence. They argue that maintaining public order can reduce crime and improve the sense of security. The theory suggests that rapid interventions to correct signs of disorder can prevent crime from escalating.

The broken window theory has significant practical implications for community policing policies and crime prevention strategies. The approach proposes that the visible presence of the police and the application of measures to maintain public order can create an environment perceived as safer, deterring criminal activity.

- **Applications**:

1. Civil police officers on urban patrols face high levels of stress when trying to maintain order in run-down areas.
2. Military police officers responsible for controlling riots in urban environments have noticed an increase in violence with the physical deterioration of the areas.
3. Forensic police officers investigating crimes in areas of high urban disorder may experience frustration and stress when dealing with ongoing violence and a lack of resources to restore order.

Theory of Structural Violence (Galtung, 1969) - Key concepts: Structural violence, social inequality, oppression

Johan Galtung (1969) developed the theory of structural violence, which describes how unjust social and economic structures perpetuate violence and negatively affect the health of populations. It suggests that violence does not only manifest itself physically, but also through structural inequalities that impede development and well-being.

Structural violence is perpetuated by systems and institutions that create and maintain inequalities. Galtung argues that true peace can only be achieved by addressing these underlying inequalities, proposing changes in social and economic structures to promote justice and equity.

- **Applications**:

1. Civil police officers working in marginalized communities face structural violence, which affects their well-being due to constant exposure to social injustices.

2. Military police officers in pacification operations deal with structural violence by trying to impose order in economically disadvantaged areas.
3. Forensic police officers investigating crimes in areas with high social oppression may suffer from chronic stress due to continued exposure to structural inequalities.

THEORETICAL MODELS ON ILLNESS AT WORK

The theoretical models on illness at work seek to understand how occupational, organizational and personal factors contribute to the development of health problems among workers. These models often use a multifaceted approach, taking into account the work environment, work demands, interpersonal relationships, and available resources.

According to Karasek (1979), the Demand-Control Model is one of the most widely used to explain stress at work. This model suggests that high levels of work demands, combined with low levels of control over work, can lead to high levels of stress and, consequently, to illness.

Another significant model is the Effort-Reward Model, proposed by Siegrist (1996). This model emphasizes the imbalance between the efforts made by workers and the rewards received in terms of wages, recognition, and opportunities for growth. A prolonged imbalance between effort and reward can lead to feelings of injustice and worthlessness, contributing to physical and mental health problems such as hypertension and depression. The theory highlights the importance of appropriate rewards in the workplace to maintain the health and well-being of employees.

In addition, House's (1981) Social Support Model highlights the importance of support networks in the workplace. According to this model, social support from colleagues and superiors can act as a *buffer*, mitigating the negative effects of occupational stress on health. Studies have shown that workers who perceive high levels of social support tend to have better mental health and a lower incidence of stress-related illnesses. This demonstrates the importance of a collaborative and supportive work environment for workers' health.

The integration of different disciplines in the elaboration of theoretical models on illness at work is crucial for a holistic understanding of the phenomenon. Collaboration between psychology, sociology, occupational medicine, and organizational management allows for the creation of more effective intervention strategies. As observed by Ganster and Rosen (2013), multidisciplinary approaches facilitate the identification of risk and protective factors in different contexts, promoting innovative and sustainable solutions to combat illness at work. The practical application of these theoretical models can guide occupational health policies and intervention programs aimed at both preventing and mitigating the negative effects of working conditions on workers' health.

We will present below the theories that supported the construction of the integrative theoretical model, differentiating the processes of health and illness between civil, military and forensic police officers.

Theory of Stress at Work (Lazarus & Folkman, 1984) - Key concepts: Stress, coping, cognitive assessment

Richard Lazarus and Susan Folkman (1984) proposed that job stress is a result of the interaction between job demands and the individual's ability to cope with them. The cognitive assessment of stress and the coping strategies adopted directly influence the health of workers. Lazarus and Folkman highlight the importance of how individuals perceive and interpret stressful situations.

The theory suggests that stress is a dynamic process, where demands and resources are constantly evaluated. Coping is the way individuals try to manage stressful demands, which can be adaptive or maladaptive. Effective coping strategies include problem-solving, seeking social support, and emotional management.

- **Applications**:

1. Civil police officers investigating violent crimes may develop inappropriate coping strategies, leading to burnout and mental health issues.
2. Military police officers on high-risk missions who fail to properly assess and manage stress may suffer from depression.
3. Forensic police officers who deal with graphic details of crimes may experience high levels of stress and difficulties in coping with the emotional demands of the job.

Burnout Theory (Maslach & Jackson, 1981) - Key concepts: Emotional exhaustion, depersonalization, low personal fulfillment.

Christina Maslach and Susan Jackson (1981) developed the theory of burnout, describing it as a state of physical, emotional, and mental exhaustion caused by prolonged involvement in emotionally demanding situations.

Burnout is characterized by emotional exhaustion, depersonalization, and a decrease in personal fulfillment. Emotional exhaustion refers to the depletion of emotional resources, while depersonalization involves a cynical and impersonal attitude towards customers or coworkers. Low personal fulfillment is a perception of ineffectiveness and lack of success at work.

- **Applications**:

1. Civil police officers dealing with victims of violent crime can experience emotional exhaustion and depersonalization.

2. Military police officers in rapid response units may experience a decrease in personal fulfillment due to constant stress.
3. Forensic police officers who work long hours analyzing evidence can feel emotionally drained and depersonalized due to the intensive nature of the job.

Demand-Control Model (Karasek, 1979) - Key concepts: Labor demand, control, social support

Robert Karasek's (1979) model suggests that the combination of high work demands and low control over work activities can lead to stress and illness. The presence of adequate social support can mitigate these negative effects. Karasek proposes that workers with high demand and low control face a higher risk of developing occupational diseases.

The theory emphasizes that social support at work, whether from colleagues or supervisors, can help reduce the impact of stress. Additionally, increasing control over tasks and decisions can improve workers' well-being.

- **Applications**:

1. Civil police officers in narcotics units face high demands and often little control over operations, resulting in stress.
2. Military police officers on combat missions with little autonomy can experience high levels of stress.
3. Forensic police officers with strict deadlines and little control over their working methods can feel overwhelmed and sick.

Labor Equity Theory (Adams, 1963) - Key concepts: Equity, rewards, justice

John Stacey Adams (1963) proposed that the perception of unfairness in the workplace can lead to stress and dissatisfaction, impacting the health of workers. The theory suggests that individuals compare their contributions and rewards with those of others, and perceptions of inequality generate tension and demotivation.

Equity theory highlights the importance of distributive and procedural justice in the workplace. When workers realize that they are treated fairly and that their contributions are recognized, they tend to have greater satisfaction and better mental health.

- **Applications**:

1. Civil police officers who feel they are not adequately compensated for their work face stress and dissatisfaction.
2. Military police officers who perceive a lack of equity in promotions may experience demotivation and mental health problems.

3. Forensic police officers who feel that their contributions are not recognized can develop symptoms of stress and burnout.

Demands and Resources Model (Bakker & Demerouti, 2007) - Key concepts: Job demands, job resources, well-being

Arnold Bakker and Evangelia Demerouti (2007) suggest that the presence of adequate resources at work can mitigate the negative effects of high labor demands. The model highlights the importance of balancing demands and resources to promote workers' well-being.

Job demands refer to the physical, psychological, social, or organizational aspects of work that require continuous effort and are associated with physiological and psychological costs. Work resources are aspects that help achieve goals, reduce demands, and stimulate personal growth.

- **Applications**:

1. Civil police officers with access to psychological support can better cope with the demands of their job.
2. Military police officers who receive adequate training for high-risk situations may experience lower stress.
3. Forensic police officers with advanced technological resources can reduce the impact of the intense demands of the job on their health.

THEORETICAL MODELS ON HIGH-RISK WORK AND EXPERIENCES WITH VIOLENCE

Theoretical models on high-risk work and experiences with violence seek to understand how certain work environments expose workers to high-risk situations and violence, significantly impacting their physical and mental health. These models use a multifaceted approach, considering individual, organizational, and contextual factors.

According to Karasek's (1979) Demand-Control Model, high-risk jobs often combine high work demands with low levels of control over work, creating an environment conducive to stress and illness. When associated with experiences of violence, these factors can further exacerbate the negative impacts on workers' health.

Siegrist's (1996) Effort-Reward Model is also relevant to understanding how risky jobs and experiences of violence affect workers' health. This model suggests that an imbalance between the efforts made by workers and the rewards received can lead to an increase in stress and the risk of illness. In work environments where violence is a constant reality, such as in emergency services and security forces, the perception of inappropriate rewards can intensify the negative effects of occupational stress. This highlights the importance of providing appropriate rewards and recognition to mitigate the impacts of violence at work.

In addition, House's (1981) Social Support Model emphasizes the importance of social support in the workplace. According to this model, the support of colleagues and supervisors can act as a buffer against the negative effects of stress and violence at work. Studies have shown that workers who perceive high levels of social support have better mental health and a lower incidence of stress- and violence-related illnesses. This model suggests that creating a collaborative and supportive work environment is crucial to protecting the health of workers in high-risk occupations.

Finally, Chappell and Di Martino's (2006) Workplace Violence Exposure Model provides a specific framework for understanding the impacts of violence in the workplace. This model considers factors such as the frequency and severity of experiences of violence, as well as the coping strategies available to workers. Continued exposure to violence can lead to a range of health problems, including post-traumatic stress disorder (PTSD), depression, and anxiety. The practical application of this model can guide interventions aimed at reducing exposure to violence and providing psychological support resources for workers.

We will present below the theories that supported the construction of the integrative theoretical model, differentiating the processes of health and illness between civil, military and forensic police officers.

Risk Theory (Slovic, 1987) - Key concepts: Risk perception, risk acceptability, risk communication

Paul Slovic (1987) developed the theory of risk perception, exploring how people assess and respond to risks, especially in hazardous work contexts. It suggests that risk perception is influenced by cognitive, emotional, and social factors.

Slovic argues that the way risks are perceived and communicated can significantly influence individuals' response. Factors such as prior experience, cultural background, and media play crucial roles in risk perception and acceptance.

- **Applications**:

1. Civil police officers who underestimate daily risks can put themselves in frequent danger situations.
2. Military police officers in high-risk operations may develop a distorted perception of danger due to constant exposure.
3. Forensic police officers who deal with evidence of violent crime may underestimate the risks associated with prolonged exposure.

Resilience Model (Masten, 2001) - Key concepts: Resilience, adversity, recovery

Ann Masten (2001) proposed that resilience is an individual's ability to bounce back from adversity and continue functioning well. This model suggests that resilience is a dynamic process influenced by individual and contextual factors.

Resilience involves positive adaptation in the face of significant adversity and is influenced by factors such as social support, self-efficacy, and coping strategies. Masten describes resilience as an "ordinary process of human adaptation" that can be developed and strengthened.

- **Applications**:

1. Civil police officers who develop resilience can better cope with the stress that comes from violent situations.
2. Military police officers who demonstrate high resilience can recover more quickly from combat trauma.
3. Forensic police officers who are resilient can continue to work effectively after analyzing brutal crime scenes while maintaining stable mental health.

Risk Exposure Theory (Wilkinson, 2001) - Key concepts: Risk exposure, vulnerability, protection

Richard Wilkinson (2001) explored how continuous exposure to hazards can increase the vulnerability of workers and highlighted the importance of effective protective measures.

The theory suggests that prolonged exposure to risky situations can lead to increased physical and psychological vulnerability. Wilkinson argues that social inequality and a lack of adequate protection exacerbate the vulnerability of individuals in risky jobs. Protective measures, such as safety equipment and proper training, are crucial to mitigate the negative effects of risk exposure.

- **Applications**:

1. Civil police officers in high-crime areas need specific protection strategies to reduce vulnerability.
2. Military police officers on dangerous missions need protective equipment and specialized training to minimize risks.
3. Forensic police officers who work with hazardous materials must follow strict protocols to avoid contamination and injury.

Coping Theory (Lazarus & Folkman, 1984) - Key concepts: Coping, stressors, coping strategies

Lazarus and Folkman (1984) focus on how people use different strategies to cope with stressors at work, especially in high-risk environments. They suggest that the effectiveness of the coping strategies adopted directly influences the well-being and health of the individual.

Coping theory highlights that stressors are an inevitable part of life, but how individuals cope with them can vary significantly. Effective coping strategies can include problem-solving, cognitive reappraisal, and seeking social support.

- **Applications**:

1. Civil police officers can use coping strategies, such as physical exercise, to deal with the stress of urban violence.
2. Military police officers can adopt *mindfulness* techniques to reduce the psychological impact of combat operations.
3. Forensic police officers can utilize social support and regular supervision to cope with the stress of analyzing violent crime scenes.

Workload Theory (Wickens, 1992) - Key concepts: Workload, performance, fatigue

Christopher Wickens (1992) examined how workload influences the performance and health of workers, especially in high-risk contexts. It suggests that an excessive workload can lead to fatigue and decrease performance, increasing the risk of errors and accidents.

The theory highlights the need to manage workload to maintain the effectiveness and health of workers. The balance between demand and capacity is crucial to prevent fatigue and ensure safe and efficient performance.

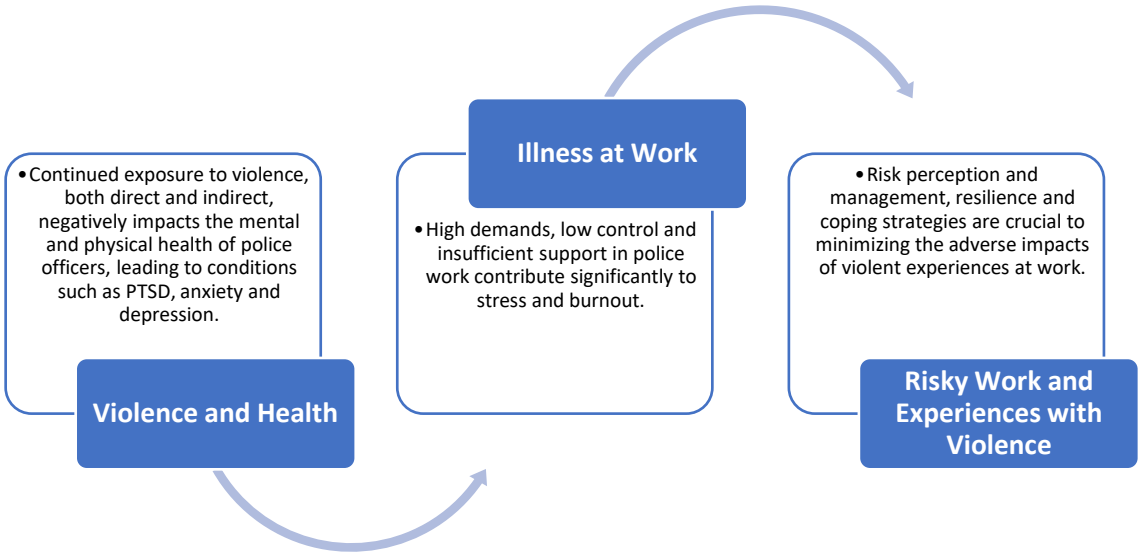
- **Applications**:

1. Civil police officers with excessive workloads may experience fatigue and decreased performance.
2. Military police officers under constant pressure can have a drop in performance and increase the risk of accidents.
3. Forensic police officers overloaded with complex cases can make critical errors in analyzing evidence due to work overload.

INTEGRATIVE MODEL DIFFERENTIATING THE PROCESSES OF HEALTH AND ILLNESS BETWEEN CIVIL, MILITARY AND FORENSIC POLICE OFFICERS

The proposed integrative model combines elements of all 15 theoretical models presented, offering a holistic view of the health and illness processes among civil, military, and forensic police officers. This model takes into account three key elements, namely: Violence and Health; Illness at Work; Risk Work and Experiences with Violence (FIGURE 01).

FIGURE 01 - Integrative Model Differentiating the Health and Illness Processes between Civil, Military and Forensic Police Officers.



Understanding the processes of health and illness among civil, military, and forensic police officers requires a holistic approach that takes into account the multiple factors that influence the well-being of these professionals.

The theoretical model integrates biopsychosocial aspects, recognizing that health is not only the absence of disease, but a state of complete physical, mental and social well-being (World Health Organization, 1946). The physical and emotional demands of the functions performed by these professionals can result in a series of health problems, from physical illnesses to mental disorders, such as post-traumatic stress disorder (PTSD), anxiety, and depression (Garbarino et al., 2011).

In addition to psychological factors, it is essential to consider the social and family aspects that affect the health of police officers. The pressure to maintain a work-life balance can be particularly intense due to the unpredictable and often dangerous nature of police work. Social support, both from co-workers and family members, plays a crucial role in mitigating the negative effects of occupational stress. Psychological support and counseling programs within corporations can help provide the necessary support to address these challenges.

Occupational factors are crucial determinants in the health and illness process of these professionals. Constant exposure to risky situations, extensive hours, and irregular shift work can lead to physical and mental exhaustion. In addition, the lack of institutional and social support can exacerbate these problems. Studies indicate that police officers often face barriers to seeking psychological help due to the stigma associated with mental health within police culture (Houdmont

et al., 2020). Therefore, a theoretical model must consider interventions that not only promote physical health, but also offer psychological and social support.

In addition to occupational factors, individual and family aspects also play a significant role. Personal resilience, coping strategies, and family support are essential elements that can mediate the negative effects of occupational stress. Police officers who have robust social support networks and effective coping strategies tend to cope better with the challenges of the profession (Violanti et al., 2017). Thus, occupational health policies should include programs that strengthen these individual and family resources, promoting a healthier and more balanced work environment.

From an organizational point of view, the culture and internal policies of police forces have a significant impact on the health of their members. A work environment that promotes mental health, with clear policies on stress management, psychological support, and burnout prevention, can considerably reduce the risks of illness. In addition, regular training in stress management and emotional resilience is essential to prepare police officers to handle high-pressure situations in a healthy manner.

Finally, it is important to include continuous assessment and early intervention in the theoretical model as fundamental strategies to maintain the health of police officers. Physical and mental health monitoring programs can help identify signs of illness early, allowing for quick and effective interventions. A holistic approach that encompasses prevention, ongoing support, and appropriate treatment is crucial to ensure that civil, military, and forensic police officers can perform their duties in a healthy and effective manner.

FINAL CONSIDERATIONS

An effective theoretical model must contain a holistic view of the health and illness processes among civil, military, and forensic police officers and must consider the complexity of the psychological and physical demands faced by these professionals. This model needs to integrate biological, psychological, social, and organizational factors that directly influence the well-being and mental health of these individuals.

It is crucial to include a public health perspective that recognizes the interdependence between police officers' health and public safety. Healthy police officers are better able to perform their duties effectively, which contributes to the safety and well-being of the community. Interventions should be multidimensional, involving training in resilience skills, access to mental health services, and family support programs.

Only through a holistic approach, which considers the multiple levels of influence on health, will it be possible to promote the integral well-being of civil, military and forensic police officers.

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Chronic kidney disease in felines and the use of SDMA for diagnosis: Literature review

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Rafaela Cristina Cardoso Costa[1], Jaqueline Aparecida Sousa Pereira[2], Bruna Cardoso Lemes[3], Fatima Christina França Alexandrowitsch[4], Karine Pereira Silveira[5], Millena Baeta Jardim[6], Yasmin Jordana Arruda Brito[7], Nara Ladeira de Carvalho[8] and Elizangela Guedes[9]

ABSTRACT

Due to the domestication process, tutors are increasingly concerned with ensuring better living conditions for their pets. This has reflected in the increased longevity of pets. Felines, due to anatomical, physiological and dietary aspects, have a certain predisposition to problems affecting the system renal.Com this, chronic kidney disease (CKD) is a progressive and irreversible disease, being an important cause of death in felines, especially with advanced age. Unfortunately, its initial signs are silent, becoming evident as the lesion progresses, thus allowing the worsening of the condition. Thus, when the diagnosis occurs, the evolution is already well established. Symmetrical dimethylarginine (SDMA) is a biomarker of renal function, correlated with glomerular filtration rate (TGF), and is used to evaluate the existence of Chronic Kidney Disease, because unlike the quantification of serum creatinine, it is not influenced by extrarenal mechanisms, for this reason it is considered more efficient. In 2015, SDMA became provisionally part of the International Society of Renal Interest (IRIS) classification of CKD as a complementary test of kidney function aiding in the classification of disease stages, thus allowing the identification of disease stages and substages. In this way, it is possible to better monitor and determine the most appropriate treatment for each patient.

Keywords: Biomarker, Precocity, Felines, Renal system.

[1] Bachelor of Veterinary Medicine from the University Center of Southern Minas (UNIS)
E-mail: rafaela.costa@alunos.unis.edu.br
[2] Master's student in Animal Health and Collective Health at the Federal University of Lavras (UFLA)
E-mail:jaqueline.pereira2@estudante.ufla.br
[3] Postgraduate student in veterinary cardiology at the National Association of Small Animal Veterinary Clinicians (ANCLIVEPA)
E-mail: bruna.lemes@alunos.unis.edu.br
[4] Undergraduate student in Veterinary Medicine at the Federal University of Lavras (UFLA)
E-mail: fatima.alexandrowitsch@estudante.ufla.br
[5] Bachelor of Veterinary Medicine from the Faculty of Sciences and Technologies of Campos Gerais (FACICA)
E-mail: karine.medveterinaria@gmail.com
[6] Bachelor of Veterinary Medicine from the University Center of Southern Minas (UNIS)
E-mail: millena.jardim@alunos.unis.edu.br
[7] Bachelor of Veterinary Medicine from the University Center of Southern Minas (UNIS)
E-mail: yasmin.brito@alunos.unis.edu.br
[8] Master's degree in Veterinary Sciences from the University of São Paulo Pirassununga Campus (USP).
E-mail: naralcarvalho@gmail.com
[9] Professor of Veterinary Medicine at the University Center of Southern Minas (UNIS)
E-mail: elizangela.guedes@professor.unis.edu.br

INTRODUCTION

The renal system has numerous functions of extreme importance in the body's homeostasis, due to: excretion of metabolic products and waste (aiding in detoxification), hormone production (allowing the processes of hematopoiesis and calcium and phosphorus balance), regulation of the volume and composition of the extracellular fluid (LEC), water excretion (regulating blood volume and pressure), excretion of ions (acting on electrolyte balance) and, consequently, influencing the regulation of the acid-base balance (HAGIWARA, 2014; REECE, 2017)

Currently, the assessment of quality of life has been shown to be increasingly important in the management of chronic diseases, since they have a negative impact on the lives of patients. In felines, due to their evolutionary process and consequently their eating, physiological and anatomical habits, they are highly affected by chronic kidney disease (CKD), an important and common nephropathy, being the main cause of death in this species, with a recently identified prevalence estimated at 1 to 3% in this species, among which 30% are over 15 years of age at diagnosis (ROBERTSON, 2015; LOURENÇO, 2019)

In the long term, this disease culminates in the appearance of toxic neurological changes secondary to the accumulation of residues of cellular catabolism, in some cases even adopting preventive measures, factors such as age, heredity, can cause the disease, especially if treated properly and in time, the animal can lead a healthy life despite some restrictions. (TOZZETTI, 2009)

Chronic Kidney Disease is characterized by the progressive and irreversible loss of nephrons, resulting from a range of kidney disorders, compromising at least 75% of their functional activity, culminating in the loss of excretory and concentrating functions of the kidneys. Thus, it is correlated with glomerular filtration rate (GFR) and functional renal mass. (MCGAVIN , 2013; ZACHARY, 2013; CRIVELLENTI, 2015)

Thus, research for more sensitive renal biomarkers is the focus of studies, as they can provide an early diagnosis, allow the establishment of appropriate therapy for each patient and improve their quality of life. (OLIVEIRA, 2020)

According to Lourenço (2019), one of the reference methods for assessing renal function, allowing the measurement of the glomerular filtration rate, corresponds to the verification of serum concentrations of urea and creatinine. These methods, because they are not used frequently, allow the use of alternative markers.

With this, the renal biomarker Symmetric Dimethylarginine (SDMA) has shown significant results in terms of early diagnosis of kidney disease, being able to detect kidney injury when 50% or less of the function is compromised. (OLIVEIRA, 2020)

This is because, according to Lourenço (2019), SDMA corresponds to a stable molecule, widely excreted by the kidney, making it a good choice as a renal biomarker, as its size and load allow it to be freely excreted by glomerular filtration. In addition, the dosage of this biomarker is extremely accurate, being used to carry out the early diagnosis of CKD, allowing the taking of renoprotective interventions that slow its progress, or aim to stabilize the disease.

The objective of this study was to perform a literature review regarding Chronic Kidney Disease in felines, the use of MDDA in the early diagnosis of Chronic Kidney Disease, in addition to evaluating its use and success by veterinary professionals in the veterinary medical routine.

LITERATURE REVIEW

FELINES AND THEIR RELATIONSHIP WITH KIDNEY DISEASE (CKD)

As discussed by Scholten (2017), cats have always played an important role in the history of human civilization, presenting adaptability, independence, and versatility. In this way, the author in her work demonstrates the importance of studies on the individuality of these animals, because even with great advances in the veterinary medical and surgical clinic of small animals, professionals and their owners are often unaware of the true nature of the cat and its normal behavior. This issue leads to a lack of understanding, which directly compromises the efficiency of diagnosis.

Therefore, Scholten (2017) made it clear that behavioral analysis is the initial measure for detecting various types of problems from different origins in domestic cats and serves as the main source of evidence for the evaluation of animal welfare. The author Lucca (2022), following the same line of reasoning, also raised in his work the importance of knowledge about the natural behavior of the species and well-being, since stress can lead to numerous losses.

Thus, the assessment of quality of life has been shown to be increasingly important in the management of chronic diseases, since they have a negative impact on the lives of patients. In cats, chronic kidney disease is the most common nephropathy and is the leading cause of death at ages above five years inclusive (FEITOR, 2021).

In cats, Chronic Kidney Disease (CKD) is considered the most common nephropathy, being associated with treatments and regular monitoring through the measurement of kidney function biomarkers. In addition, the International Renal Interest Society (IRIS) aims to facilitate the diagnosis and clinical management of this disease (Polzin, 2016).

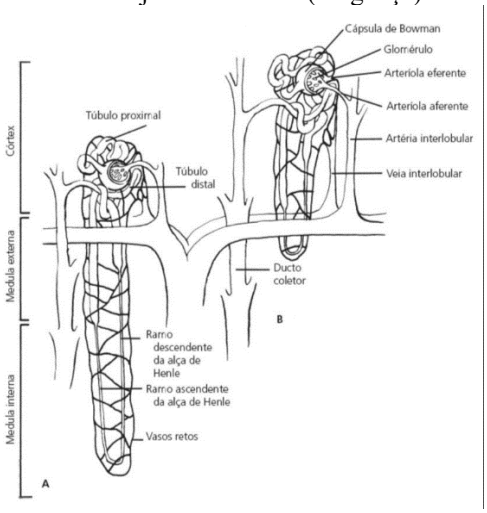
More recent studies suggest that CKD is higher (more than 40%) among felines aged 5 to 15 years, reaching a higher involvement (80%) in cats over 15 years of age (Marino et al., 2014).

Thus, kidney health over the last few years has drawn the attention of veterinarians, as the impairment of this organ in chronic renal failure is an important cause of morbidity and mortality in felines. Thus, Agopian (2016), in his study, proposes the biometric characterization of the kidneys of cats, Felis catus, under the macroscopic (length, height, width, weight and volume), mesoscopic (height of the cortex and medulla, and their interrelation) and microscopic (glomerular volume) aspects, in order to establish possible differences resulting from age, sex and bilateral symmetry.

Although more studies are needed on the possible existence of racial predisposition, apparently this disease is more common in the Maine Coon, Abyssinian, Siamese, Russian Blue, Burmese and Ragdoll breeds. The presence of a history of Acute Kidney Disease (ARD) or nephropathies, as well as the administration of nephrotoxic drugs are also considered risk factors (Maniaki & Finch, 2018; Langston & Eatroff, 2020)

Cats, as reported by Reece (2008) and Konig, Maierl and Liebh (2016) and Carvalho (2020), can have approximately 190,000 nephrons in each kidney, having a large number of long-loop juxtamedullary nephrons (Figure 1), which justifies the ability to concentrate their urine, and consequently the greater predisposition to diseases related to this system. Thus, kidney failure is a very common condition in the species, about 50% to 60% of cats will have some kidney dysfunction at some point in their lives, especially in senile animals. (PAZ, 2016).

Fig. 1. Types of mammalian nephron. A. néfron justamedulares (long alça) B. néfron corticais. Source: Reece, 2017



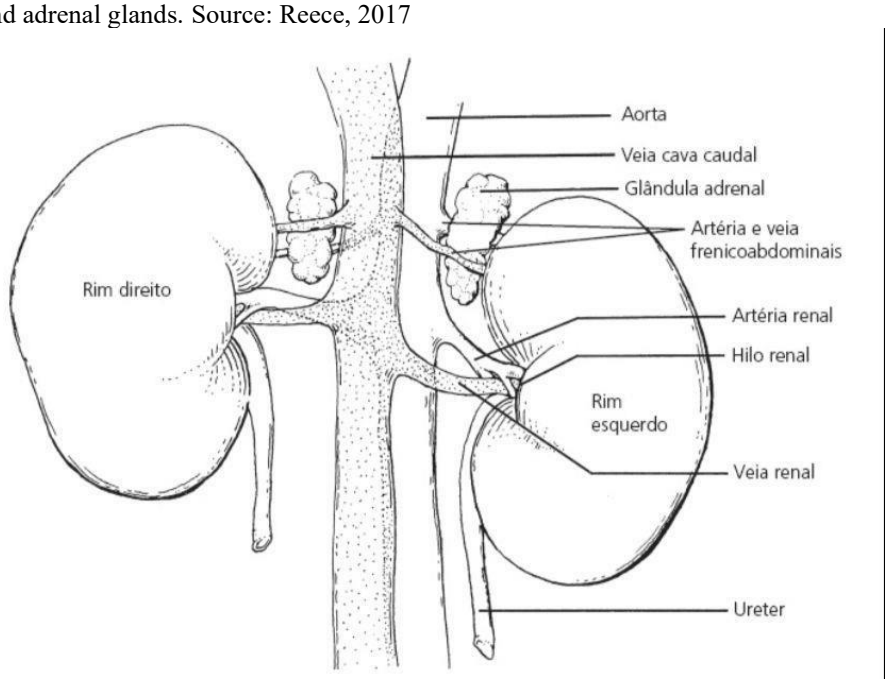
The main nephropathies in the feline species are: acute renal failure, chronic kidney disease, bacterial pyelonephritis, glomerulopathies, polycystic renal disease, amyloidosis, nephrotoxicosis and neoplasms (Anjos, 2014). This highlights the need for early diagnosis techniques, in order to allow the clinician to intervene as quickly as possible, and can delay the process of advancement and worsening of the disease. (PAZ, 2016).

RINS

The feline kidneys are located in the retroperitoneal space, being separated by the peritoneal envelope, caudomedial to the splenic cranial portion, lateral to the aorta, with an appearance similar to "beans". (KOGIKA, WAKI, MARTORELLI, 2015).

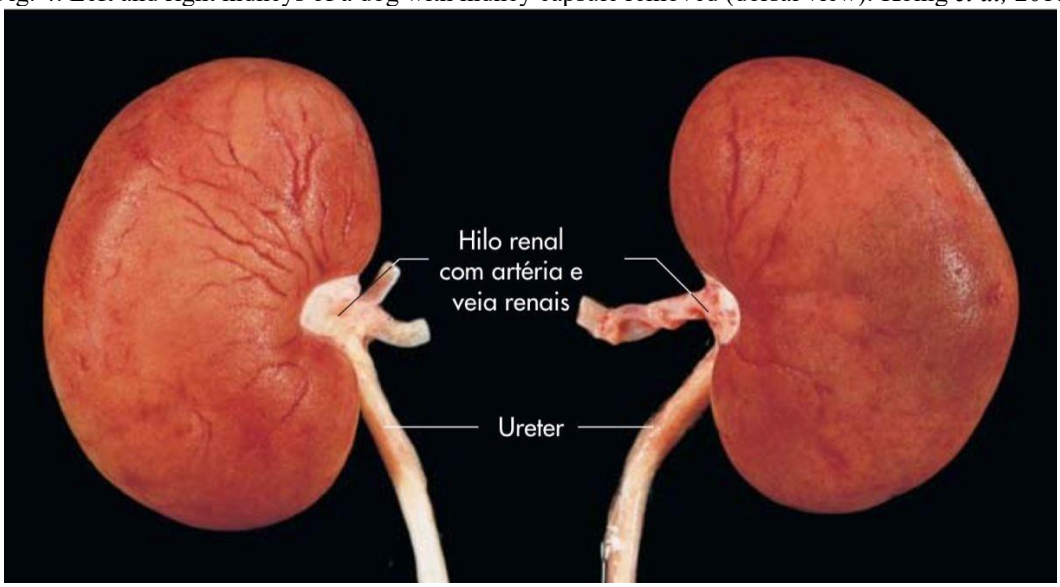
The renal system, Jericho (2015), Konig, Maierl and Liebh (2016) and Reece (2017), is then composed of the pair of kidneys, which are organs surrounded by fatty tissue, paired and suspended in the dorsal abdominal wall by a peritoneal fold and blood vessels, renal artery and renal vein, being responsible respectively for the irrigation and drainage of each organ. These vessels flow into the organ through the renal hilum (**Figure 3**), at the medial border, which is in the concave part of the organ, where it is also possible to find the nerves and lymphatic vessels, in addition to the ureter. They are located cranial to the mid-lumbar region, where in the feline species, the right kidney is positioned near the L1-L4 vertebrae, while the left kidney, the L2-L5. These are what can contribute to its localization during abdominal palpation (KOGIKA, WAKI, MARTORELLI, 2015).

Fig. 3. Ventral view of the kidney, showing the renal arteries, renal veins, and ureters and their position in relation to the aorta, vena cava, and adrenal glands. Source: Reece, 2017



Each kidney, Hagiwara (2014) and Reece (2017), has a cortical region and a medullary region **(Figure 4),** which we observe striations due to anatomical dispositions of the loops of Henle of the nephrons of long loops. In this region we also find the collecting tubules, which aim to conduct the glomerular filtrate to the renal pelvis and posterior to the urethra.

Fig. 4. Left and right kidneys of a dog with kidney capsule removed (dorsal view). Konig *et al,* 2016

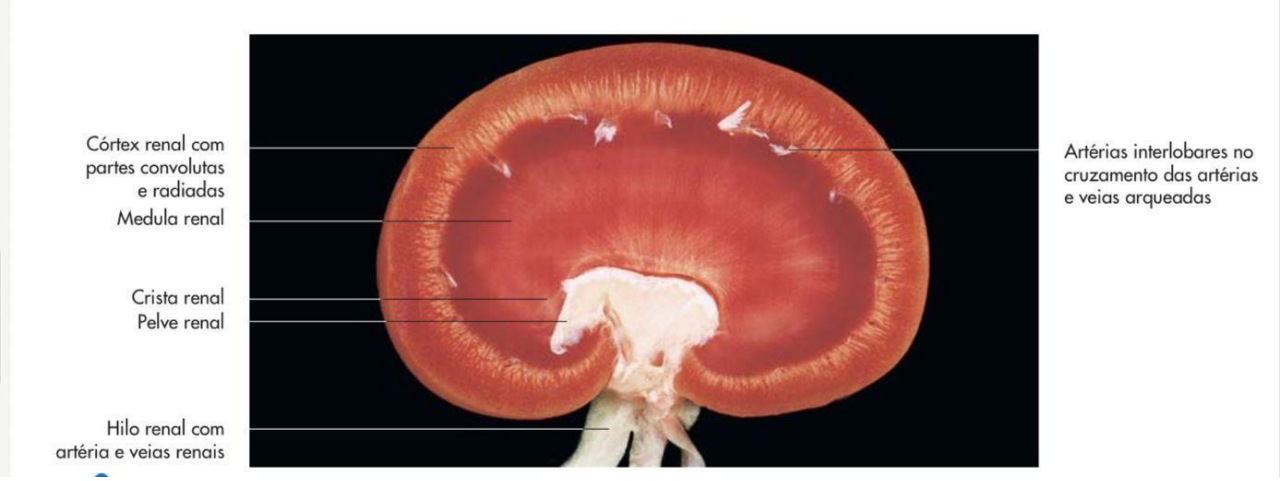


We observed in dogs and cats that the kidney is unilobar, composed of a group of nephrons and covered with a fibrous capsule; The parenchyma is formed by a medullary region and a cortical region. In small animals, the corticomedullary ratio is approximately 1:2 or 1:3. (KOGIKA, WAKI, MARTORELLI, 2015). A mean cortical renal thickness of 0.82 ± 0.14 cm and medullary thickness of 0.59 ± 0.06 cm have been described in healthy felines (DEBRUYN et al., 2012).

The renal parenchyma is surrounded by a resistant fibrous capsule, a thin and shiny fibroelastic membrane called the renal capsule, which enters the medial aspect of the kidney to line the walls of the renal sinus, protecting it from certain diseases. This capsule remains attached to the pelvis and blood vessels, and can be easily removed from a healthy kidney during postmortem examination, but adheres to it after the tissue has been marked by disease. (KONIG *et al,* 2016; VERLANDER, 2007, SANDOVAL, 2018)

The blood supply of this system is derived from the Abdominal Aortic Artery, which will branch into the renal artery, and from the renal parenchyma, into the interlobar artery (which will supply the renal lobe, the corticomedullary junction and the cortical region) **(Fig. 5**), and, subsequently, into glomerular capillaries (EVANS, DE LAHUNTA, 2010; KOGIKA, WAKI, MARTORELLI, 2015)

Fig. 5. Equatorial section of the smooth unipyramidal kidney of a dog. Taken from Konig *et al,* 2016



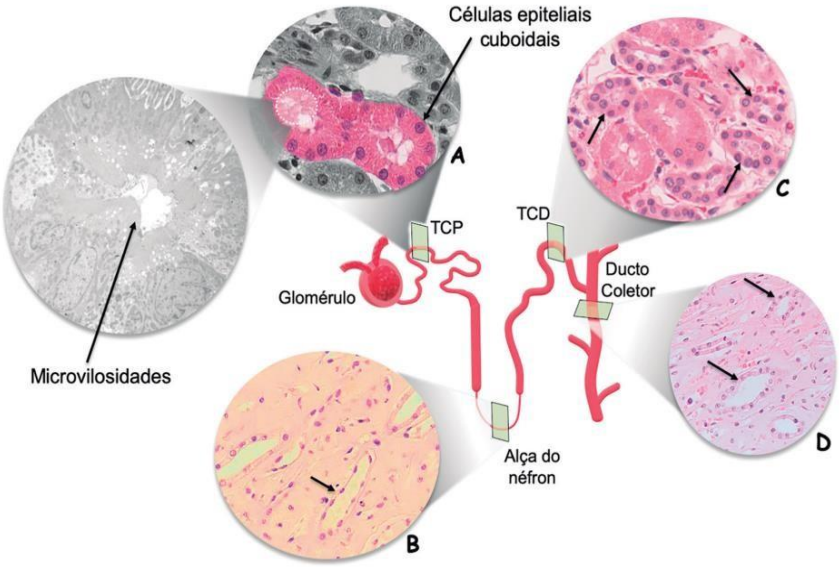
The wall of these capillaries has three layers (**Fig. 6**), the innermost portion being a continuation of the endothelium of the afferent arteriole, covered by a layer of endometrial cells, which have fenestrae, which allow the passage of water and other molecules of low molecular weight. The intermediate layer, consisting of a glomerular basement membrane (GBM) is another structure that offers resistance to the filtration of macromolecules. The third component of the filtration process is the epithelial layer, made up of podocytes, giving rise to the visceral leaflet of Bowman's capsule. (RIELLA, 2010; KOGIKA, WAKI, MARTORELLI, 2015; CRIVELLENTI *et al* 2021).

ANATOMOPHYSIOLOGY OF GLOMERULAR FILTRATION

Glomerular filtration rate (GFR) measures the amount of filter formed in the nephrons of both kidneys (in mL) per unit time (minutes) per body weight (in kg) of the animal. It is an extremely important parameter for verifying renal functionality, and with this, verifying Chronic Kidney Disease. (FINCH & HEIENE, 2017; NHANHARELLI, 2018)

Structurally, there are differences between the tubular segments (**Figure 9**), with histological differences related to different physiological functions. CRIVELLENTI *el al*, 2021

Figure 9 – Histopathology scheme of the renal tubules. A) Proximal convoluted tubule (TCP) and enlarging microvilli can be observed under electron microscopy. B) Nephron loop. C) Distal convoluted tubule. D) Collecting duct. Source: CRIVELLENTI *el al,* 2021



The filtration process has as its starting point the glomerulus, located in the renal cortex, and is composed of a filtration membrane containing three layers: fenestrated capillary endothelium, glomerular basement membrane and cells of the visceral epithelium of the glomeruli (podocytes). What determines the continuous filtration rate is the pressure of the blood inside this glomerulus, thus flowing the fluid into Bowman's capsule and, subsequently, into the proximal convoluted tubule also located in the renal cortex. Following this path, the fluid will be directed to the loop of Henle, which is divided into a thin and thick segment. Subsequently, this filtrate penetrates into the distal tubule, also located in the renal cortex. (SERAKIDES and SILVA, 2016, König *et al.,* 2021; CRIVELLENTI *et al* 2021)

Also in the renal cortex, the junction of the distal convoluted tubules will occur, to form each collecting tubule, which will launch the glomerular filtrate into the renal pelvis through the renal papillae. This filtrate is similar to plasma, however it does not have large amounts of proteins (macromolecules), because they do not cross the wall of the capillaries. On the other hand, small amounts of albumin end up being filtered, and due to the importance of this protein in the body, they are quickly absorbed from the proximal convoluted tubule. (Reece, 2008; COLVILLE *et al.*, 2010; VERLANDER, 2013; SERAKIDES and SILVA, 2016)

As the glomerular filtrate evolves along the renal tubules, substances that are unnecessary for the body maintain their path, while those that are necessary, especially almost all water and many electrolytes, are reabsorbed into the peritubular capillaries. This reabsorption process is favored due to the low blood pressure in this capillary network, with about 99% of this filtrate being reabsorbed, leaving a small portion that will contribute to the formation of urine. (Verlander, 2013; SERAKIDES and SILVA, 2016)

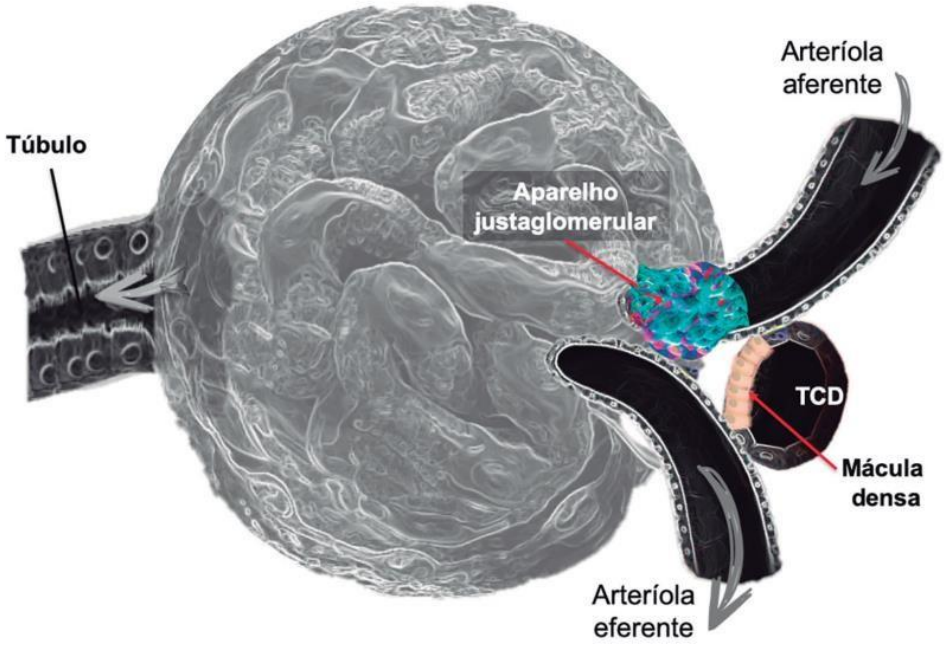
Tubular secretion is the process that occurs when substances pass from plasma through the epithelial cells, which line the tubules, to the tubular fluid, which is the second mechanism, after glomerular filtration, by which the nephron secretes undesirable substances into the plasma. Thus, urine is made up of substances that have been filtered and secreted, and this amount of glomerular filtrate formed per minute is called the Glomerular filtration rate. (COLVILLE, 2010; Verlander, 2013; SERAKIDES and SILVA, 2016)

The intensity of glomerular filtration is determined by three factors: glomerular pressure, plasma colloidsmotic pressure, and pressure in Bowman's capsule. Thus, there are some conditions that affect these factors and consequently the intensity of glomerular filtration, such as renal blood flow, constriction of the afferent arteriole, and constriction of the efferent arteriole. (SERAKIDES and SILVA, 2016)

Inside the kidneys, through local mechanisms, such as feedback, the intensity of glomerular filtration and renal blood flow is controlled. To achieve this, each nephron can trigger vasodilator feedback from the afferent arteriole or vasoconstrictor feedback mechanism from the efferent arteriole. (REECE, 2008, COLVILLE *et al.*, 2010; Konig *et al.*, 2020)

The juxtaglomerular complex (**Figure 10**) is formed by the macula densa (epithelial cells of the distal convoluted tubules in contact with the afferent and efferent arterioles) and by the juxtaglomerular cells (smooth muscle cells of the afferent and efferent arterioles that secrete renin). (COLVILLE, 2010, REECE, 2017)

Figure 10 – Macula densa and juxtaglomerular apparatus are closely linked and work to maintain the proper filtration rate. TCD: distal convoluted tubule. Source: CRIVELLENTI *el al*, 2021



In the event of a reduction in the flow of the glomerular filtrate, it will result in a low concentration of chloride and sodium ions in the macula densa, triggering a signal from the macula densa to dilate the afferent arteriole, with consequent increase in blood flow to the glomerulus and increase in glomerular pressure. The low concentrations of these ions (chloride and sodium) will also induce the juxtaglomerular cells to release renin, which, in turn, results in the formation of angiotensin II, responsible for the production of vasoconstriction of the efferent arterioles, culminating in the elevation of glomerular pressure. (SERAKIDES AND SILVA, 2016; FINCH & HEIENE, 2017)

This increase in glomerular pressure results in increased blood flow, resulting in an increase in filtration intensity until the required level is reached. Thus, vasodilation of the afferent artery is one of the most important mechanisms for self-regulation of blood flow. (COLVILLE, 2010)

When there is a drop in renal blood flow, the glomerular filtration rate will also be affected, suffering a decrease. Due to this reduction, a feedback effect is generated in the juxtaglomerular complex, resulting in dilation of the afferent arteriole, allowing greater blood flow through the glomerulus and greater filtration. (HAGIWARA, 2014)

In cases of very low glomerular filtration, it would result in a slowdown of the fluid by the renal tubules, and with this practically all of it would be reabsorbed, thus compromising the elimination of necessary catabolic products. On the other hand, if the intensity of glomerular filtration were high, the glomerular filtrate would pass so quickly through the renal tubules that they would be unable to absorb the substances that should be preserved in the body, resulting in numerous losses. That is why it is extremely important to maintain the constancy of the glomerular filtration rate. (HAGIWARA, 2014; SERAKIDES and SILVA, 2016)

Thus, the proximal convoluted tubule, the longest segment, has epithelial cells with high metabolism, with a large number of mitochondria, to maintain the processes of rapid active transport. Thus, the primary function of these cells is the absorption of 70% of the glomerular filtrate. (COLVILLE, 2010; VERLANDER, 2013)

In this segment, there is an important active reabsorption of glucose and amino acids, in addition to sodium, calcium, potassium, chloride and phosphate ions. Hydrogen ions represent the most important substance secreted by active transport, filtered urea, approximately 30 to 40% is reabsorbed in these tubules, and creatinine does not have reabsorption by nephrons, but becomes more concentrated as the reabsorption of other substances occurs. (SERAKIDES and SILVA, 2016; REECE, 2017)

The first two-thirds of the TCP are called the "pars convolute" and followed by the final third called the "pars recta". This differentiation is not only present in the name, but in structure

and function. The CPET epithelium is subdivided into three types: segment 1 (S1), which makes up the initial short segment of CPET; segment 2 (S2), which makes up the rest of the CPT and the cortical part of the pars recta; and, finally, segment 3 (S3), composed of the medullary segment of the pars recta. CRIVELLENTI *el al,* 2021

In sequence, the small segment of the loop of Henle, responsible for urine concentration, has a thin epithelium, with absence of cells on the brush edge and a reduced number of mitochondria, indicating minimal metabolic activity. REECE, 2008; REECE, 2017.

This capacity in concentration is proportional to the length of the loop of Henle, with the descending branch being highly permeable to water and moderately permeable to urea, sodium and most other ions. While the ascending branch has less permeability to water and solutes (urea and ions). (COLVILLE, 2010; HAGIWARA, 2014, CARVALHO, 2020)

The thick segment of the loop of Henle has taller epithelial cells, similar to those of the proximal tubule, but its cells have a rudimentary brush border, and they are highly adapted for the reabsorption of sodium and potassium ions. On the other hand, this segment is almost completely impervious to water and urea. (VERLANDER, 2013; HAGIWARA, 2014)

Regarding the distal tubule, its first half has characteristics similar to the thick segment of the ascending ramus of the loop of Henle. Its cells absorb most ions, but in relation to water and urea they are almost completely impermeable. (COLVILLE, 2010; HAGIWARA, 2014)

The final portion of the distal tubule and the cortical portion of the collecting tubule have epithelium that is almost completely impermeable to urea. These two segments absorb sodium ions at a speed controlled by aldosterone. In these segments, the active secretion of potassium ions also occurs, controlling the concentration of these ions in the body's extracellular fluids. In these segments it is also possible to find a special epithelial cell, known as an intercalated cell, responsible for actively secreting hydrogen ions. Related to water, its permeability only occurs in the presence of antidiuretic hormone (ADH), in order to provide a means to control the degree of dilution of urine (SERAKIDES and SILVA, 2016).

The collecting tubule has cuboid cells in the composition of its epithelium, which have a smooth surface, and few mitochondria. The permeability of water, in this segment, is also controlled by ADH, and in relation to urea, it has slight permeability. An important characteristic of this segment is related to the ability to secrete hydrogen ions, in this way, the final portion of the distal convoluted tubule and the collecting tubule play an important role in controlling the acid-base balance of body fluids. REECE, 2008, REECE, 2017; HAGIWARA, 2014

Thinking about the acid-base balance, the first systems associated with this maintenance are the body plugs and pulmonary control (from the excretion of carbon dioxide), thus forming

the first line of defense in maintaining the pH of extracellular fluids. (SERAKIDES and SILVA, 2016 ; REECE, 2017)

With this in mind, the normal blood pH is approximately 7.4, so the kidneys also participate in this correction of the acid-base imbalance, performing the correction of metabolic alkalosis by the excretion of alkaline urine with excess bicarbonate ions, or in metabolic acidosis by increasing the reabsorption of bicarbonate, by the secretion of hydrogen ions or by the excretion of ammonia. (VERLANDER, 2013; SERAKIDES and SILVA, 2016)

During embryonic development, the urinary system is closely associated with the genital system. Both have a mesodermal origin, from the urogenital crest, located along the posterior wall of the abdominal cavity.(SERAKIDES and SILVA, 2016)

The primary function of the kidneys consists of the formation of urine, thus keeping the composition of body fluids within the physiological parameter. (KONIG *et al,* 2016, Carvalho, 2020)

To understand renal function, according to Serakides and Silva (2016) and Garcia (2011), understanding the functionality performed by nephrons is essential, precisely because they are responsible for maintaining the physiological integrity of the volume and constituents of the extracellular fluid. This is possible due to the ability to conserve water, fixed cations, glucose and amino acids; elimination of nitrogenous products from protein metabolism (urea, creatinine, uric acid, and urates); plasma clearance of excess sodium, potassium and chloride ions; elimination of excess hydrogen ions to maintain the pH of body fluids and elimination of endogenous and exogenous organic compounds. In addition to these functions, the kidneys also have endocrine functions, producing the hormone renin (responsible for the conversion of angiotensin I into angiotensin II, involved in the process of arterial constriction and consequently increased blood pressure), bradykinin (causes the dilation of blood vessels), erythropoietin (stimulates the process of erythropoiesis), in addition to the production of 1,25dihydroxycholecalciferol and prostaglandins. (KONIG *et al,* 2016; SERAKIDES and SILVA, 2016; POLZIN, 2017)

Erythropoietin synthesized in the kidneys, according to Serakides and Silva (2016) and Verlander (2017), is a glycoprotein produced by interstitial and/or endothelial cells of the peritubular capillaries of the cortical and medullary regions, in occurrence of a reduction in blood oxygen concentration, so it acts directly on the stimulation of erythropoiesis by the bone marrow.

Renin, according to Serakides and Silva (2016), is also a glycoprotein synthesized by the cells of the juxtaglomerular complex, in which there is a decrease in blood pressure due to the reduction in extracellular volume. Renin converts angiotensinogen into angiotensin I, which is

then converted into angiotensin II, exerts an effective vasoconstrictor action, in addition to causing the stimulation of aldosterone release by the adrenal cortex, resulting in increased sodium reabsorption and, consequently, water reabsorption from the renal tubules. These effects corroborate the elevation of blood pressure.

In addition to these activities, according to Serakides and Silva (2016) and Polzin (2017), the kidneys are also involved in the final stage of transformation from the inactive form of vitamin D to the biologically active form, that is, they convert 25hydroxycholecalciferol, which originates from the hepatic pathway, into 1,25dihydroxycholecalciferol, essential in the process of intestinal calcium absorption.

The secretion of prostaglandins, according to Serakides and Silva (2016), is carried out through the cells of the interstitium, the collecting ducts, and the wall of the renal arteries through the action of cyclooxygenases 2. Prostaglandins have little influence on the maintenance of blood pressure under normal conditions. However, in periods of hypotension, they exert a great contribution to the regulation of renal blood flow, sodium and water transport, and glomerular filtration, precisely by the release of renin and antidiuretic hormone and, indirectly, by the release of angiotensin II, aldosterone, and kallikrein.

Thus, according to Serakides and Silva (2016) and Takasa (2017), when using non-steroidal anti-inflammatory drugs (NSAIDs), great care must be taken with the dose, period of administration and hydration status of the patient, since the vasodilation performed by prostaglandins in the medullary region can be suppressed due to the inhibitory action of NSAIDs on the synthesis of cyclooxygenases 2. Thus, the medullary region, which usually already has less blood supply compared to the cortical one, can suffer ischemia process, resulting in necrosis of the renal papillae and extensive areas of the medullary region.

For the kidneys to perform their functions efficiently, the following are necessary: normal urine elimination, adequate blood perfusion, and functional kidney tissue. To perform their functions well, the kidneys carry out three essential processes: glomerular filtration and tubular resorption and secretion. (SERAKIDES and SILVA, 2016; KONIG *ET AL* 2021)

CHRONIC KIDNEY DISEASE IN FELINES

Chronic Kidney Disease is a syndrome linked to the progressive alteration of the excretory and endocrine functions of the kidney related to extensive (more than 70%) and irreversible lesions of the renal parenchyma. It may or may not result in a drop in the Glomerular Filtration Rate (GFR), depending on the stage. It is characterized by a permanent increase in urea and blood creatinine due to a drop in urinary density. (MORAILLON, 2013)

The term renal failure was recently replaced by renal disease, where through the staging of the severity of the disease, it provides a better understanding, communication and application of the necessary management guidelines. (ROUDEBUSH, 2009)

Chronic renal failure (CKD) occurs due to the inability of the kidneys to perform their functions, as a result of the progressive and gradual loss of kidney tissue over a prolonged period (months or years). Commonly, it is irreversible and is the end result of many kidney diseases, usually but not necessarily, chronic. CRF is not synonymous with chronic kidney disease, so there can be CRF without chronic kidney injury, and vice versa. In CKD, several extrarenal lesions can be observed. Regardless of whether or not uremia is of renal origin, the lesions that result from uremia are similar and are primarily intrarenal and multisystemic. (COLVILLE, 2010; SERAKIDES and SILVA, 2016)

It is the most common urinary tract disorder in cats, being responsible for high rates of morbidity and mortality, having several origins, which, however, are often unknown. It consists of a structural kidney injury, for at least 3 months, due to its insidious evolution, resulting in the occurrence of irreversible damage, observing a 50% drop in GFR. (GUSSO, 2021; JERICÓ, 2015; MARCUZ, 2022)

The feline species, according to Reece (2008) has 190,000 functional nephrons in each kidney, which compared to other species, such as cattle (4,000,000), is a small number. Normal TGF values in felines are 2 to 4 ml/min/kg. These are dependent on adequate renal blood flow, the number of functional nephrons and both tubular and interstitial blood pressure, thus being a method that is not so simple to measure (THRALL *et al.,* 2015; CRIVELLENTI *et al* , 2021).

Chronic renal failure corresponds to a pathology commonly found in dogs and cats, with prevalences of 0.5 to 7% and 1.6 to 20%, respectively, being one of the frequent affections in the feline species, increasing with age, and can thus reach 80% in geriatric cats. Although there is no racial and age predilection, morbidity and mortality are predominant in older dogs and cats (WAKIL et al., 2010; MARIANO *et al*, 2014).

This system is so important that according to Paz (2016), about 20% to 25% of the total body flow is destined to the kidneys, evidencing the need for a greater volume of blood flow when compared to other organs. Thus evidencing its susceptibility to injuries, justified due to its unique anatomical and functional characteristics, such as the significant blood supply from cardiac output, its filtering and biotransforming function.

Thus, due to the high need for blood flow, associated with these particularities, they confer greater vulnerability to injuries and possible pathologies, especially of a toxic, ischemic and infectious nature (PAZ, 2016; PAIVA, 2018)

The distribution of renal circulation is not uniform, approximately 90% irrigates the renal cortex and 10% is destined to the medullary region. Therefore, it is justifiable that a more vascularized region is more susceptible to lesions caused by toxins, while the portion with small blood supply presents more problems in the case of systemic hypotension, easily suffering ischemic episodes. (Langston, Estroff, 2010; Paz, 2016)

In terms of symptomatology, we can separate them into three phases, namely: Installation Phase (initial), State Phase (uremic CKD) and Terminal Phase. The installation phase is characterized by being silent, where I will observe the increase in water consumption and the decrease in urinary density. However, urea and creatinine levels may be normal. In the second phase, the animal may present dehydration, asthenia, weight loss, digestive signs (dysorexia, vomiting, diarrhea, ulcers, anemia (due to a drop in erythropoietin synthesis), arterial hypertension, bone demineralization (linked to secondary hyperparathyroidism) that causes pain, lameness. (MORAILLON, 2013)

Finally, in the terminal phase, we may observe oliguria or anuria, worsening of the animal's general condition (asthenia, thinness, anorexia, dehydration), worsening of digestive problems, modified respiratory curve (metabolic acidosis), nervous signs, tremors, uremic coma. In addition, we also observed a very significant increase in urea and creatinine. (MORAILLON, 2013)

In summary, the main manifestations observed in clinical routine will be apathy, anorexia, emesis, weakness, dehydration, polyuria, polydipsia, constipation, diarrhea. Treatment should be carried out based on the stage of the disease and individualized according to the case of each patient. (MARCUZ, 2022)

After the onset of the disease, due to the lesions and loss of nephrons, there is a compensatory increase in the glomerular filtration rate (GFR) of each patient, with an increase in the intraglomerular pressure of the remaining nephrons. The increase in flow in the capillary causes an increase in the passage of proteins and thus, greater filtration of them (NHANHARELLI, 2018)

Its clinical treatment is palliative. The therapeutic goal is to normalize fluid balance, resolve hemodynamic inadequacies, and promote urine formation. (PALUMBO, 2011).

Currently, due to evolutionary processes, it has allowed the emergence of some advanced renal therapies, such as: renal replacement therapy (dialysis and hemodialysis), kidney transplantation and stem cell therapy. However, these techniques have some limitations such as the associated costs that are often impeding their realization, their availability and the fact that they require further investigation (Jepson & Syme, 2017)

In chronic kidney disease, there is usually destruction of all renal structural components. Thus, in the advanced stages of many nephropathies, it is difficult or even impossible to define the primarily injured structure. (SERAKIDES and SILVA, 2016)

Kidney lesions, according to Polzin (2011), can be represented macro or microscopically, requiring the use of imaging techniques for the detection of macroscopic morphological changes, analysis of serum or urine samples for functional analysis, and tissue biopsy for the detection of histological changes of the parenchyma.

Thus, due to the relevance of the kidneys in physiological processes, as well as the maintenance of the body's homeostasis, studies for the determination of renal biometric parameters are fundamental, since they can serve as a reference for future clinical evaluations. The information obtained in morphometric studies determines parameters that can be used as a reference both in clinical studies and to compare possible changes resulting from various diseases. Some of them can highlight the importance of understanding the functioning of the kidneys. (AGOPIAN, 2016)

In both medicine and veterinary medicine, different stains and additional methodologies are required for the diagnosis of nephropathies, including light microscopy (LM), transmission electron microscopy (TEM), and immunofluorescence (IF) (CRIVELLENTI *et al*, 2021)

PATHOPHYSIOLOGY OF CHRONIC KIDNEY DISEASE

Chronic renal failure, according to Colville (2010), Chew, Dibartola and Schenck, 2012; Serakides and Silva, 2016; Fidalgo, 2019, can be characterized by the occurrence of uremia and azotemia, due to Pre-renal, Renal and Post-renal occurrences. Uremia is a biochemical disorder in which there is an increase in the levels of urea and creatinine, among others, being associated with clinical signs and lesions, on the other hand, azotemia is a term mistakenly used as a synonym for uremia, however it refers only to the elevation of blood urea and creatinine concentrations, without presenting clinical signs and systemic lesions.

PRERENAL CAUSES

Prerenal occurrence is due to decreased blood supply to the kidneys, which can be due to congestive heart failure, circulatory shock and hypovolemia (severe hemorrhages and dehydration). Thus, due to this decrease in blood supply and consequently renal perfusion, the glomerular filtration rate is reduced, thus retaining in the blood the unnecessary and toxic substances that should be eliminated through urine. (COLVILLE, 2010; SERAKIDES and SILVA, 2016)

In addition, this reduction in vascularization can result in ischemia, with consequent degeneration and necrosis of the cells of the tubular epithelium. In this way, prerenal azotemia can be supplanted by azotemia of renal origin. It is unlikely that a process of prerenal uremia will occur, since the causes mentioned above can lead to the death of the animal or cause ischemic nephrosis before causing prerenal uremia. Therefore, the most common is the occurrence of prerenal azotemia (SERAKIDES and SILVA, 2016; FIDALGO, 2019)

RENAL CAUSES

Renal occurrence occurs due to acute or chronic injuries that will reflect in the reduction of renal function to levels incompatible with normality. Thus, at the renal level, the most important changes that occur are the loss of functional nephrons and the decrease in GFR. This decrease leads to an increase in plasma concentrations of substances that would normally be eliminated from the body through renal excretion, such as amino acids, peptides, ammonia, aliphatic and aromatic amines, creatinine, gastrin, renin, urea, uric acid, glucagon, growth hormone, among others (SERAKIDES and SILVA, 2016; POLZIN, 2007)

And due to this increase in the concentrations of these substances, the so-called uremic syndrome can originate, which according to Grauer (2007) and Rodriguez (2012) encompasses water and sodium imbalance, anemia, carbohydrate intolerance, neurological and gastrointestinal tract changes, osteodystrophy, immunodeficiency and metabolic acidosis.

In addition, it is important to remember the functions of hormonal formation such as erythropoietin and catabolism of several peptide hormones, resulting in hormonal changes reflecting on the pathogenesis of this disease. (TREVISAN, 2016)

Justifying the occurrence of osteodystrophy that occurs secondary to hyperparathyroidism, due to the attempt to maintain plasma concentrations of calcium and phosphorus. The occurrence of proteinuria and glomerulosclerosis can also be justified by the increase in GFR in an attempt to maintain adequate functionality, developing hyperfiltration, which leads to injury and loss of functional nephrons (GRAUER, 2007; TREVISAN, 2016)

Systemic arterial hypertension can also contribute to the progressive loss of nephrons, causing irreversible glomerular lesions through increased intraglomerular pressures and glomerulosclerosis. (GRAUER, 2007)

Acute renal failure is characterized by azotemia (renal azotemia), among other biochemical alterations. Chronic renal failure is characterized by uremia and can be used as a synonym for renal uremia (SERAKIDES and SILVA, 2016)

POSTRENAL CAUSES

The postrenal occurrence may be due to complete obstruction of the urinary flow, the most common being in the bladder and urethral region, and rarely bilateral urethral obstruction, which will only result in azotemia or uremia in cases where the contralateral kidney is altered. It can be due to causes intrinsic to the lower urinary tract, such as urolithiasis, bladder and urethral tumors. Or extrinsic factors, such as uterine tumors, prostatic hyperplasia, severe prostatitis and bladder paralysis caused by spinal cord injuries. (COLVILLE, 2010; SERAKIDES and SILVA, 2016)

CAUSES OF CHRONIC KIDNEY DISEASE (CKD) IN CATS

Among the causes of CKD in felines, we can mention chronic tubulointerstitial nephritis of unknown cause, being the most common pathological diagnosis. Chronic pyelonephritis or chronic glomerulonephritis, both of which can be difficult to differentiate histologically when compared to chronic tubulointerstitial nephritis. In addition, we can mention: Amyloidosis (of familial origin in Abyssinian cats) and Polycystic kidney disease (of familial origin in Persian cats). **(** CHEW, DIBARTOLA and SCHENCK, 2012**)**

Among other causes we can also mention: Hypercalcemic nephropathy, Progression after AKI, Chronic obstructive uropathy (such as hydronephrosis as a consequence of ureteral urolithiasis), Neoplasm (such as renal lymphoma), Acromegaly (excessive production of growth hormone) resulting in renomegaly. Piogranulomatous nephritis due to feline infectious peritonitis (FIP), hypokalemic nephropathy (kalopenic). And finally, due to chronic toxicity (associated with food, drugs and environmental toxins) and primary systemic hypertension. **(** CHEW, DIBARTOLA and SCHENCK, 2012**).**

DISORDERS CAUSED BY CKD

Uremia

The biochemical disorders of uremia are characterized by alterations in the control of extracellular fluid volume and basic acid and electrolyte balance, in the metabolism of hormones, and in the excretion of products from protein catabolism. (SCHENCK, 2012)

Uremia occurs from the reduction of GFR by 75%, which so far adaptive measures by intact nephrons have been performed with the objective of maintaining renal function at adequate levels. However, with this high impairment, resulting in a significant reduction in GFR, undesirable substances such as sulfates, phosphates, urea, uric acid, creatinine, etc. begin to occur. Thus, the verification of urea and creatinine concentrations are important parameters in this phase for renal evaluation. SERAKIDES and SILVA, 2016; CRIVELLENTI *et al*, 2021.

Uremic toxins refer to any compound that accumulates in excess due to decreased kidney function and contributes to the clinical signs of uremia.

These toxins are composed of guanidine, products of bacterial metabolism (such as polyamines, aliphatic amines, untamed), myoinositol, oligoelements, and medium molecules. (CHEW, DIBARTOLA and SCHENCK, 2012)

Uremia, whether of renal origin or not, can lead to extrarenal and multisystem lesions in various systems, such as the digestive system (stomatitis, glossitis, ulcerative and necrotizing esophagitis, necrosis of the tip of the ear (rare), ulcerative and hemorrhagic gastritis, hemorrhagic pancreatitis), respiratory system (pulmonary edema, mineralization of the subpleural connective tissue of the intercostal spaces), cardiovascular system (ulcerative atrial endocarditis and mucoarteritis), locomotor and endocrine system (fibrous osteodystrophy, rubber jaw). (SERAKIDES and SILVA, 2016; CRIVELLENTI *et al*, 2021)

In the urinary system (fibrosed and mineralized kidneys, nephrocalcinosis may occur), in the hematopoietic system (aregenerative anemia in uremia occurs due not only to a reduction in the synthesis of erythrocytes, but also due to hemolysis and hemorrhage), in the nervous system (animals may not present macroscopic lesions, but may present neurological and motor signs, which characterize uremic encephalopathy). (SERAKIDES and SILVA, 2016; CRIVELLENTI *et al*, 2021)

Dehydration

The dehydration caused will be triggered by a decrease in tubular reabsorption and associated with a loss of responsiveness to ADH, in addition to lesions in the medullary region of the kidneys, which may be aggravated by vomiting and diarrhea, which occur in cases of uremia. SERAKIDES and SILVA, 2016; CRIVELLENTI *et al*, 2021.

Metabolic acidosis

The decrease in tubular secretion causes potassium retention, which can lead to cardiotoxicity, and hydrogen ions, which leads to acid-base imbalance. Due to this imbalance, associated with the reduction of ammonia production by the distal convoluted tubules and collecting duct, associated with a decrease in the reabsorption of bicarbonate ions, results in metabolic acidosis. (SERAKIDES and SILVA; CRUZ, 2016)

Vitamin D and Calcium Deficiency

Due to kidney injury, the transformation of 25hydroxycholecalciferol into 1,25-dihydroxycholecalciferol is compromised due to the kidney being injured, resulting in deficient

formation of the active form of vitamin D. In this way, calcium deficit can lead to tetany (spasmodic contractions of skeletal muscles) and muscle weakness. SERAKIDES and SILVA; PEREIRA, 2013; POLZIN *et al*., 2016)

This reduction of calcium concentrations in the extracellular medium results in increased excitability of the nervous system, due to the increased permeability of the axon membrane of neurons to sodium ions. With this, the triggering of the action potential is facilitated, where the nerve fibers spontaneously discharge, thus sending a series of nerve impulses directed to the skeletal muscles, triggering tetanus muscle contractions. SERAKIDES and SILVA, 2016; POLZIN *et al.*, 2016)

Phosphorus Retention

Because the kidneys are unable to excrete phosphorus through the urine, hyperphosphatemia and absolute hypocalcemia develop, and this calcium reduction is aggravated by the kidneys' inability to convert 25-hydroxycholecalciferol into 1,25di-hydroxycholecalciferol. SERAKIDES and SILVA, 2016; PEREIRA, 2013; CRUZ, 2016)

In addition, the parathyroid glands are stimulated to produce parathyroid hormone, resulting in excessive bone resorption in order to try to balance the serum levels of calcium and phosphorus. However, parathyroid hormone also increases the renal excretion of phosphorus, however, as the kidneys do not respond to it, phosphorus retention occurs in the body. Result in a condition of secondary renal hyperparathyroidism. SERAKIDES and SILVA, 2016; PEREIRA, 2013; CRUZ, 2016)

Deficient Erythropoietin Training

Due to the injury, the kidneys start to have their ability to form erythropoietin compromised, resulting in minimized synthesis of erythrocytes by the bone marrow, resulting in an aregenerative anemia, with a variable aspect in relation to severity. (SERAKIDES and SILVA, DiBARTOLA; WESTROPP, 2015)

DIAGNOSIS

The frequency of diagnosis has increased significantly in the last decade. The sharp increase in the prevalence of CKD may be an improvement in the recognition of the disease or a real increase in its incidence in the feline population. (VALENTE, 2019)

To identify renal failure, the following can be performed: anamnesis, complementary tests such as radiographs, abdominal ultrasound, laboratory tests (**Table 2**), such as: blood count, serum biochemistry and urinalysis. Unfortunately, the diagnosis usually tends to occur only in

the more advanced stages of the disease due to the appearance of clinical signs (**Table 1**) that are caused by the great loss of renal function. (GUSSO, 2021; MARCUZ, 2022)

CLINICAL SIGNS

The clinical manifestations (Table 1) of the disease are not always evident or may not even exist, which is the case of asymptomatic patients. (KOGIKA et al., 2015). With regard to the anamnesis of felines with CKD, polyuria and polydipsia are the signs that owners most easily recognize, although they only appear when the ability to concentrate urine is already lost and there is a loss of 67% of kidney function. The onset and presentation of clinical and biochemical episodes that occur in patients with CKD may vary, depending on the nature, severity, duration, speed of progression of the underlying condition, presence of a coexisting disease, but not related to the patient's age and species, and administration of therapeutic agents (POLZIN et al., 2010). 37 Some animals affected by CKD may present clinical manifestations such as loss of body weight and muscle mass, polyuria and polydipsia, hyporexia or even 13 anorexia, vomiting, halitosis, gastroenteritis and gastric ulcerations (BARTGES, 2012)

Table 1. Aspects of chronic kidney disease

Anemia arregenerativa
Apetite diminuído com mais de 3 meses de evolução
Azotemia
Diminuição do tamanho renal
Halitose urêmico
Osteodistrofia renal
Pelame ressequido e quebradiço
Perda de peso corporal por mais de 3 meses
Presença de poliúria e polidipsia por mais de três meses
Sinais clínicos discretos

Fonte: adaptado de Polzin, 2011.

COMPLEMENTARY EXAMS

In complementary tests, tests should be used to assess renal concentration capacity, glomerular permeability, and especially glomerular filtration rate (GFR), which is routinely evaluated indirectly through the quantification of markers that must be eliminated from the body through the urinary tract. With the use of such tests, the degree of renal impairment of the patient and the staging of the lesions are determined. (SILVA; MARCUSSO, 2017)

Among some of the most common alterations, we observed azotemia and hyperphosphatemia in serum biochemistry during the advancement of chronic kidney disease (CKD), resulting from reduced glomerular filtration rate (GFR). (GARCIA, 2011)

Thus, currently the laboratory diagnosis of Kidney Injury is extensively performed by means of serum biochemistry of creatinine, however, it does not have the ability to detect mild degrees of loss of renal function, due to its low sensitivity, making it unfeasible to measure it as an early diagnosis method, being feasible in patients with a reduction of 75% in GFR, indicating moderate to severe renal involvement. Classifying it as a late marker due to neglect of the early stages of the injury. (POLETTO, 2016; PAIVA, 2018).

In addition, creatinine is interfered with by several factors that are independent of the kidneys, such as eating time, muscle mass index, and age, which compromises its role as a marker of this organ. (PAIVA, 2018)

Serum creatinine concentration is not capable of detecting mild degrees of loss of renal function, due to its low sensitivity, making it impossible to measure it as an early diagnosis method, being feasible in patients with a reduction of 75% in GFR, indicating renal impairment of moderate to severe intensity. (POLETTO, 2016).

Table 2 - Complementary laboratory tests for the diagnosis of feline chronic kidney disease.

Marcadores sanguíneos	Marcadores urinários	Imagenologia
Acidose metabólica	Diminuição da gravidade urinária	Modificação de tamanho e contorno renal
Elevação na concentração da ureia	Proteinúria	Alterações na densidade do parênquima renal
Elevação da concentração de creatinina sérica	Cilindrúria	Mineralização tecidual
Hiperfosfatemia	Cistinúria	
Hipercalemia ou hipocalemia	Alteração no pH urinário	
Hipoalbuminemia		

Fonte: adaptado de Polzin, 2011.

STAGING OF CKD FOR SOCIETY INTERNATIONAL RENAL INTEREST (IRIS) 2023

Thus, the diagnosis and management of CKD, due to being a routine reality in the clinical practice of small animals, can be classified into stages by IRIS (International Renal Interest Society), which formulated the CKD guidelines for staging and treatment of patients, standardizing management and diagnostic practices. This classification considers the stages of

the disease according to the time of evolution and the presence of markers of kidney injury (CHEW, DIBARTOLA and SCHENCK, 2012, VALENTE, 2019; OLIVEIRA, 2020)

This planning for the classification of Kidney Disease outlined by IRIS aimed to support the application of appropriate clinical guidelines for the diagnosis, therapy and prognosis of this disease. In order to allow a correct knowledge of the evolution of kidney injury, patients with diseases that predispose to CKD, without clinical and laboratory alterations, are considered to be stage 01 (DALTON, 2011)

This staging system will continue to evolve through new research and new clinical studies, in order to diagnose kidney disease in advance, which will allow the institution of preventive, treatment and monitoring measures, which will delay the progression of the disease, improving the quality of life of patients with kidney disease. (GUSSO, 2021).

Staging of chronic kidney disease (CKD) is performed after the diagnosis of CKD, in order to facilitate appropriate treatment and monitoring of the patient. Staging is initially based on fasting blood creatinine or fasting blood SDMA, assessed on at least two occasions in the stable patient. SDMA may be a more sensitive marker that is less impacted by the loss of lean body mass. It is important to note that the patient must be hydrated and stable. After this, the feline can be understaged based on proteinuria and systemic blood pressure. (IRIS, 2023).

Table 3. Staging of CKD based on blood creatinine and SDMA concentrations

CÃES Creatinina sanguínea SDMA	**GATOS** **Creatinina sanguínea** **SDMA**	COMENTÁRIOS
<125 µmol/l <1.4 mg/dl <18	<140 µmol/l <1.6 mg/dl <18	Creatinina sanguínea normal ou aumento normal ou leve SDMA de sangue. Alguma outra anormalidade renal presente (como, capacidade inadequada de concentração urinária sem causa não renal identificável (em gatos, não em cães), palpação renal anormal ou achados de imagem renais, proteinúria de origem renal, biópsia renal anormal resultados, aumentando a creatinina sanguínea ou SDMA concentrações em amostras coletadas em série). Persistentemente concentração elevada de SDMA no sangue (>14 µg/dl) pode ser usado para diagnosticar DRC precoce
125 –250 µmol/l 1.4 – 2.8 mg/dl 18 - 35	140 – 250 µmol/l 1.6 – 2.8 mg/dl 18 - 25	Creatinina normal ou levemente aumentada, azotemia renal leve (a extremidade inferior da faixa está dentro das faixas de referência para creatinina para muitos laboratórios, mas a insensibilidade de concentração de creatinina como um teste de triagem significa que pacientes com valores de creatinina próximos ao limite superior limite de referência frequentemente apresentam falha excretora). levemente SDMA aumentado. Sinais clínicos geralmente leves ou ausentes.
251 – 440 µmol/l 2.9 – 5.0 mg/dl 36 - 54	251 – 440 µmol/l 2.9 – 5.0 mg/dl 26 - 38	Azotemia renal moderada. Muitos sinais extrarrenais podem ser presentes, mas sua extensão e gravidade podem variar. Se sinais estão ausentes, o caso pode ser considerado como estágio inicial 3, enquanto a presença de muitos ou marcados sinais sistêmicos pode justificar a classificação como estágio avançado 3.
>440 µmol/l >5.0 mg/dl >54	>440 µmol/l >5.0 mg/dl >38	Aumento do risco de sinais clínicos sistêmicos e urêmicos crises

Table 3. Staging of CKD based on blood creatinine and SDMA concentrations. IRIS (2023). Adapted by Rafaela Cristina

Table 4. Proteinuria Substaging

CÃES (VALORES)	GATOS (VALORES)	SUBESTÁGIO
<0.2	<0.2	Não proteinúrico
0.2 to 0.5	0.2 a 0.4	proteinúrico limítrofe
>0.5	>0.4	proteinúrico

Source: Adapted from Iris (2023).

Canine and feline patients with persistent proteinuria should be reassessed at 2 months and reclassified as appropriate. Veterinarians may offer treatment for cats persistently in the borderline proteinuric range or microalbuminuria, considering the association with proteinuria of this level and progressive kidney disease in the cat (see treatment guidelines). Proteinuria may decrease as renal dysfunction worsens, and therefore may be less frequent in dogs and cats in stages 3 and 4. Response to any treatment given to reduce glomerular hypertension, filtration pressure, and proteinuria should be monitored at intervals using UP/C. IRIS (2023)

Table 5. Blood pressure understaging

Pressão arterial sistólica (mm Hg)	Pressão arterial Subestágio	Riscos futuros de Danos aos Órgãos alvos
<140	Pressão normal	Mínimo
140 – 159	Pré- Hipertenso	Baixo
160 – 179	Hipertenso	Moderado
≥180	Severamente Hipertenso	Alto

Source: Adapted from Iris (2023).

Canine and feline patients should be evaluated by multiple measurements. The final classification should be based on multiple systolic blood pressure determinations, preferably made during repeated visits of the patient to the clinic on separate days, but acceptable if during

the same visit, at least 2 hours apart, between determinations. Patients are under-staged for systolic blood pressure according to the degree of risk of target-organ injury and whether there is evidence of target-organ injury or complications. IRIS (2023)

REVIEW OF STAGING AND SUBSTAGING AFTER TREATMENT

The stage and substages assigned to the patient should be reviewed appropriately as changes occur. For example, a substantial increase in the concentration of creatinine or SDMA in the blood may warrant reassignment to a higher stage. Or, in patients assigned to antihypertensive (or antiproteinuric) treatment, the classification of the patient in the reassessment should be adjusted according to the need, according to the new blood pressure, instead of the original state previously. IRIS (2023)

TREATMENT

According to Iris (2023), all treatments for chronic kidney disease (CKD) need to be adapted to each patient. Serial follow-up of these patients and treatment adapted according to the response to treatment is ideal.

According to Crivellenti (2015), the treatment can consist of antiemetics (in cases of vomiting), use of fluid therapy and hydration, where animals in stages 3 and 4 may not be able to compensate for polyuria with polydipsia, making them chronically dehydrated (hyporexia, constipation, prerenal azotemia, and predisposition to acute kidney injury). That is why it is important to use an esophageal tube or subcutaneous route to administer water and electrolytes. Hypertension control should also be performed, and a calcium blocker may initially be used. Control of hyperphosphatemia is required, treatment of hypocalcemia, control of hypokalemia, treatment of proteinuria (increased U-P/C).

According to Crivellenti (2015), anemia should also be treated, which can be through the supplementation of water-soluble vitamins, use of mucosal protectors, iron supplementation, hormone therapy or blood transfusion. Treatment for metabolic acidosis, urinary tract infection (rarer compared to dogs, and should be guided by culture and antibiogram results), hemolysis and peritoneal dialysis when necessary, and in the last cases kidney transplantation should be performed.

Research has shown that high-protein diets increase filtration glomerular hyperemia cause renal hyperemia and increase renal volume by causing hypertrophy of the tubular epithelium and increased glomerular volume. These effects are mediated by the increase in insulin-like growth factor 1 (IGF1). Hyperfiltration results from vasoconstriction in the efferent arteriole, which consequently increases glomerular pressure; however, this increased

pressure in the glomerular capillaries predisposes to glomerular injury. In patients suffering from kidney disease, low-protein diets have a protective effect on kidney function by reducing the formation of toxic metabolites such as phosphate, uric acid, and urea. (SERAKIDES and SILVA, 2016)

In cats, according to Crivellenti (2015), whose anorexia has persisted for more than 3 days, esophageal or gastric tubes should be used, representing an important difference compared to dogs.

Studies with animals and humans carried out by Ramezani (2014), point to the use of prebiotics and probiotics, verifying that they can play therapeutic roles in maintaining a metabolically balanced intestinal microbiota and reducing the progression of patients with CKD with complications associated with uremia.

RENAL BIOMARKER: SDMA (SYMMETRICAL DIMETHYLARGININE)

Symmetric Dimethylarginine (SDMA) is one of the most current molecules and recently inserted in renal evaluation in small animal clinics, especially when the goal is early access to CKD. (PAIVA, 2018)

SDMA is a small molecule, measuring around 202 Da, from the intracellular methylation of the amino acid arginine, first isolated 48 years ago, from human urine (KAKIMOTO and AKAZAWA, 1970). In veterinary medicine, SDMA was first studied 12 years ago, aiming at a correlation with LR (PEDERSEN, 2006; TATEMATSU et al., 2007).

Symmetric Dimethylarginine results from protein methylation, with approximately 90% excreted by the kidneys, with no tubular reabsorption (Braff, Obare, & Yerramilli, 2014; El-Khoury et al., 2016). Thus, as discussed by Braff et al. (2014), its serum concentration is closely correlated with the Glomerular Filtration Rate. SDMA is a methylated presentation of arginine, originating after enzymatic proteolysis inside nucleated cells, released into the bloodstream, for subsequent renal excretion, directly correlated to GFR, without suffering extrarenal interference, as occurs with RCs (BURESOVA et al., 2019).

A study covering 18 studies in humans found that SDMA correlated strongly with the main markers of renal function, mainly serum creatinine (Crs) and Glomerular Filtration Rate, and is therefore considered an endogenous marker of function (KIELSTEIN et al., 2006). Thus, in studies to be carried out in dogs and cats, the same correlation was verified, being proposed, similar to humans, as an endogenous marker of renal functioning (PEDERSEN, 2006; JEPSON et al., 2008; BRAFF et al., 2014; NABITY et al., 2015; HALL et al., 2016).

SDMA, as previously reported, is a new, accurate renal biomarker used to calculate Glomerular Filtration Rate (GFR), initially estimated and used in humans, and is more sensitive

than serum creatinine to assess renal dysfunction (RELFORD; ROBERTSON; CLEMENTS, 2016), included as part of the IRIS guidelines, modified in 2015, for staging early and advanced CKD (HALL et al., 2017), allowing for an early diagnosis of patients in stage IRIS I (Hall, Yeramilli & Obare 2014)

In 2015, SDMA was incorporated into the International Renal Interest Society (IRIS) Chronic Kidney Disease (CKD) staging guidelines, which recognized it as a renal function test that complements the determination of serum creatinine in the evaluation of renal patients (RELFORD et al., 2016). Thus, SDMA presents itself as an interesting biomarker for the early diagnosis of CKD, both in dogs and cats, although more studies are needed for a better understanding of its action and determination of possible extrarenal influences.

A relevant fact for the use of SDMA would be for the diagnosis of chronic kidney disease (CKD) in cats with hyperthyroidism, since this disease leads to an increase in the Glomerular Filtration Rate and a reduction in muscle mass, covering the levels of serum creatinine, which can silence and hinder the identification of Kidney Injury (BOAG et al., 2007; PETERSON, 2016).

Following this line of reasoning, Peterson et al. (2016) proposed the use of SDMA in these cases, however in only one third of the 206 felines evaluated was the test effective in predicting azotemia, although it was a more sensitive marker in predicting creatinine elevation. Similar to the idea of this study, an IDEXX® fact sheet presented data from a retrospective survey, in which in a population of 2,000 feline patients with chronic kidney disease and hyperthyroidism, SDMA was able to identify 20.6% of CKD as opposed to 3.5% of serum creatinine.

The literature reports on the use of SDMA not only for the evaluation of chronic kidney injuries, but also for the detection of other alterations, such as acute injuries and in patients with kidney stones, although it does not allow the distinction between diseases (HALL et al., 2014a; DAHLEM et al., 2017; HALL et al., 2017). In addition, according to Nabity et al. (2015), this marker also has the ability to monitor the progression of the injury, and can be used for this purpose.

Recently, Pelander et al. (2019), conducted a study to compare the performance in the global diagnosis of SDMA and serum creatinine for the detection of Glomerular Filtration Rate (GFR) when it was reduced, observing that the two respective markers had a similar diagnostic value.

Thus, for serum creatinine (CRs) and SDMA, the existence of a nonlinear correlation with GFR is assumed, and as there is a decrease in filtration rate, there will be a serum increase in both markers. However, the value of one marker will not directly influence the result of the

other, and the level of CRs may not yet be noticed while that of SDMA is already a concern (BURESOVA et al., 2019; PETERSON et al., 2018).

It is important to work on the thought that, probably, no marker used individually is sufficient to assess kidney function and damage. Thus,[for the execution and construction of a diagnosis of CKD, multiple findings must be taken into account, such as: clinical presentation, physical examination, laboratory and imaging tests (POLZIN, 2011; RELFORD et al., 2016, (HOKAMP and NABITY, 2016). Thus, in this context, markers can help in the early detection of such evidence (POLZIN, 2011).

With this in mind, an early test to screen patients with suspected chronic kidney disease is important so that interventions can be initiated as soon as possible, seeking to delay the progression of the disease (HALL et al., 2014b; HOKAMP and NABITY, 2016)

According to Hall et al. (2014a), the increase in SDMA occurs, on average, 17 months before serum creatinine. Studies also suggest that it is not influenced by muscle mass in dogs and cats (Hall et al., 2014b, 2015; Nabity et al., 2015). Thus, early Chronic Kidney Disease should be suspected when SDMA is elevated and serum creatinine is unchanged. Therefore, the measurement of this biomarker is recommended in the diagnosis of non-azotemic cats and in cases of muscle atrophy (Polzin, 2016).

Reis (2019) carried out in his work carried out a survey to evaluate the behavior of the renal biomarkers symmetric dimethylarginine (SDMA), serum creatinine (CRs) and the urinary protein:creatinine ratio (UPC) in apparently healthy cats and cats with chronic kidney disease. Where it was found that, for symptomatic cats for CKD, it will be necessary to be substaged according to the IRIS (2017) criteria (UPC, CRs, PAS and SDMA) and to carry out renoprotection measures in an attempt to control the progression of the present CKD. And for apparently healthy cats, the behavior of SDMA was within the normal range for the species, with a borderline urinary creatinine value (UPC), suggesting quarterly or semiannual monitoring and follow-up, according to clinical evaluation.

FINAL CONSIDERATIONS

According to the information above, emphasizing all the indispensable functions of the kidneys, it is important to observe the importance of studies and research on new alternative ways to evaluate and diagnose pathologies of the urinary system in felines, especially chronic kidney disease. In this way, through the use of early markers, it is possible to ensure greater longevity for felines, preserving their well-being and living conditions. It is worth mentioning that even though it is a promising biomarker, according to data in the literature, it is necessary to combine other parameters to diagnose CKD, not using SDMA individually.

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Carbon precipitation on the bonding line between deposited material and base material using an additive manufacturing process

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Henrique Cechinel Casagrande[1], Anderson Daleffe[2], Gilson de March[3], Carlos Antônio Ferreira[4], Joélson Vieira da Silva[5], Hadrian Martins[6], Lirio Schaeffer[7], Jovani Castelan[8] and Daniel Fritzen[9]

ABSTRACT

The additive manufacturing (AM) technique creates parts from successive deposition of material layer by layer. What makes this process a great industrial power is the savings in raw materials, compared to other types of manufacturing processes, as well as the manufacture of complex or customized parts, which other techniques would not be able to meet, or would depend on complementary processes. However, when dealing with metal MA, more precisely the method using the electric arc, high temperatures are required for wire fusion, generating heat transfers between the materials. Thus, this study seeks to understand the influence of temperature on the behavior of carbon precipitation on the contact surface between the base plate and the layers of material deposited by this process. Two consumables were evaluated, AWS A5.18 ER70S-6, and AWS A5.20 E71T-1C wire. For mechanical characterization, a Vickers microhardness test was performed, and for structural evaluation, metallographic analyses were performed. After the microhardness test, an increase in hardness on the outside of the wall of 11 % was found for the E71T-1C wire, and 17 % for the ER70S-6 wire, however, for the E71T-1C material, this value was maintained with a layer of up to 0.3 millimeters, while for the ER70S-6 material, this layer was 0.1 millimeters. The metallographic evaluation showed carbon precipitation from the base material to the added material, as well as the appearance of dendrites and Widmanstätten ferrite in the deposited metals.

Keywords: Additive Manufacturing, ER70S-6 Wire, E71T-1C Wire, SAE 1020.

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INTRODUCTION

The understanding of metallurgical characteristics is necessary when there is a need for dimensioning for structural projects, automotive or aeronautical industry, where manufacturing error must be mitigated, or even in the space industry, where components with high mechanical strength and with the lowest possible weight are required.

Thus, additive manufacturing has been used for the manufacture of complex components, which compared to other manufacturing processes can improve production time, providing a rapid creation of a basic model, or a prototype from which other models and the product itself in its final version will be obtained [1][2][3]. In addition, other notable characteristics can be mentioned, such as the level of detail and the use of more than one material in the construction [4].

Even with these benefits, parts produced by this technique typically require machining to meet dimensional tolerances and surface finish. However, even with the additional machining step, additive manufacturing remains a more economical alternative to fully subtractive machining, given the lower material disposal [5].

In this type of printing technique, when starting the process, a base metal plate is usually used to support the first layer. Normally, this base has similar characteristics to the deposition material, however, it is important to understand the influence of the base metal on the first deposited layers. Thus, this work investigates the influence of the thermal exchange of the medium and the printed product and analyzes the carbon precipitation of the base metal to the deposited material.

For the analysis of the metallographic characteristics, an optical microscope was used and the mechanical evaluations were performed using the results of Vickers microhardness. However, to understand the chemical composition present in each material, the optical emission spectrometry technique was used.

THEORETICAL FRAMEWORK

ADDITIVE MANUFACTURING

Additive manufacturing (AM), commonly known as 3D printing, is a rapidly evolving technology with significant advances in the field of manufacturing processes, transforming the concepts of production lines in various industries. The American Society for Testing and Materials (ASTM) has defined AM as "a constituent linking procedure to generate things from 3D model statistics, typically layer upon layer, as divergent from subtractive engineering procedures" [6].

Emerging in the mid-1980s, AM has become a cutting-edge technology that has driven the latest industrial transformation. Based on the principle of layer-by-layer construction of three-dimensional (3D) structures directly from computer-aided design (CAD) models. AM techniques

offer several advantages, including design customization, minimal use of tools, and the ability to manufacture more technically complex products. [7, 8].

WAAM

Arc flash additive manufacturing (WAAM) is an additive manufacturing process that uses an arc flash as a heat source to melt metal feed wire and deposit it into desired 3D shapes [9].

WAAM manufacturing allows the construction of elements on a large scale, relatively quickly and economically, suitable for the construction sector where cost is a key point. Despite the potential of this new technology, the fundamental properties of WAAM materials remain elusive [10].

ARAME AWS A5.18 ER70S-6

The wire used to manufacture the samples was ER70S-6. This, in turn, has a low carbon content, which is around 0.08% by weight. Usually, this material is used for the manufacture of metal structures and general use in metallurgy, due to its affordable cost compared to other materials [11]. Table 1 shows the chemical composition according to the standard.

Table 1: Chemical Composition of AWS A5.18 ER70S-6 Wire

C (%)	Mn (%)	Si (%)	P (%)	S (%)	Ni (%)	V (%)	Cr (%)	Mo (%)	Cu (%)
0,06 0,15	0,04 0,85	0,80 1,15	0,025 Max	0,035 Max	0,15 Max	0,03 Max	0,15 Max	0,15 Max	0,5 Max

Source: [11].

ARAME AWS A5.20 E71T-1C

AWS A5.20 E71T-1C wire is suitable for welding structures made of carbon steel and low-alloy structural steel with tensile strength greater than or equal to 490MPa. It also has widespread application in the marine industry, mechanics and pressure vessels, low and medium carbon steels, heavy construction, and maintenance workshops. This wire offers an excellent deposition rate, stable arc for a superior bead finish, low spatter index, and easy slag removal, providing efficiency and yield in operation [12]. Table 2 shows the chemical composition according to the standard.

Table 2: Chemical Composition of AWS A5.20 E71T-1C Wire

C (%)	Mn (%)	Si (%)	P (%)	S (%)	Ni (%)	V (%)	Cr (%)	Mo (%)	Cu (%)
0,12 Max.	1,75 Max.	0,90 Max.	0,030 Max.	0,030 Max.	0,50 Max.	0,08 Max.	0,20 Max.	0,30 Max.	0,35 Max.

Source: [12].

SAE 1020 STEEL

SAE 1020 steel was used as a substrate or base material. This material is considered low carbon and is commonly used in the metalworking industry due to its ductility, machinability, and

weldability characteristics. The main applications are in the automotive, railway, naval, civil construction, and aeronautical industries, as well as in the manufacture of sheets and tubes [13] [14].

METHODS

Next, it will present how this study was carried out, the materials used, and tests for chemical and mechanical characterization.

OPTICAL EMISSION SPECTROMETRY

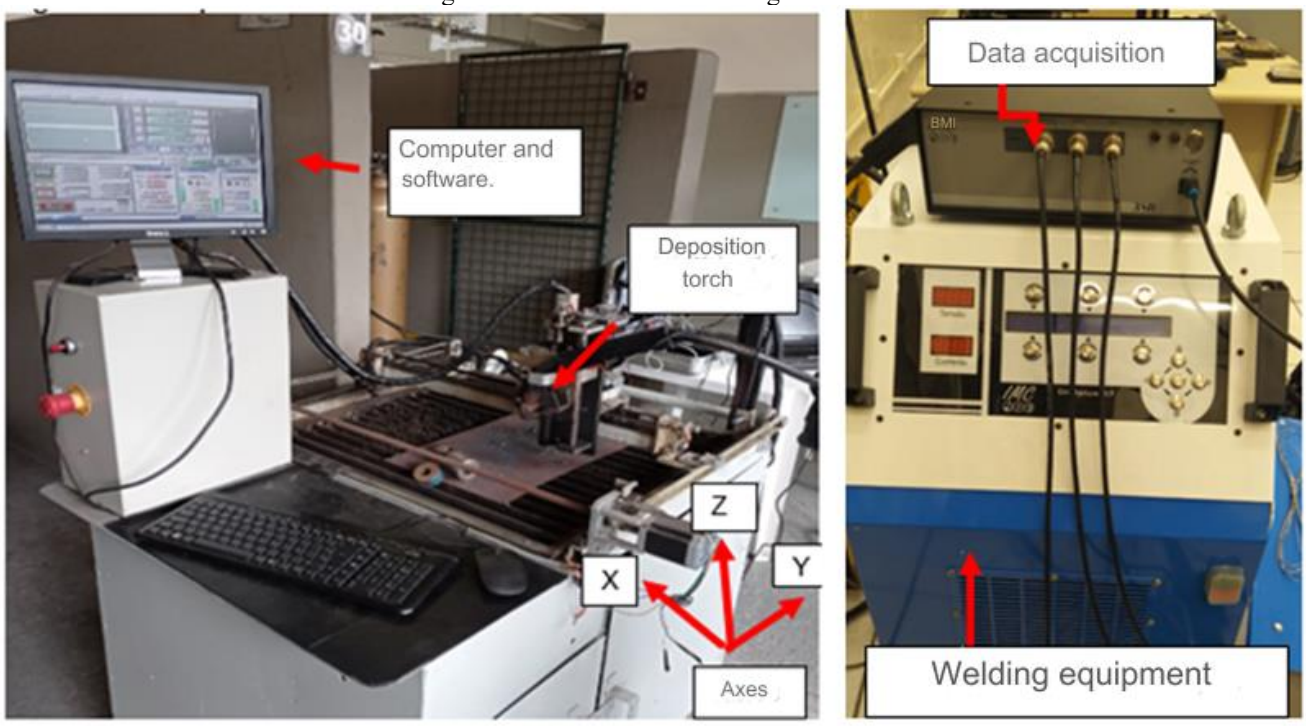
For the chemical determination of the wire, the optical emission spectrometry test was performed. The equipment used was a spectrometer from the manufacturer BRUKER, model Q2 ION. The power used was 400 Watts for 30 seconds. The triplicate test is highlighted to validate the method.

ADDITIVE MANUFACTURING MACHINE

To print the samples, a welding machine from the manufacturer IMC model DIGIplus A7 was used, linked to the SAP 3SR data acquisition device.

Figure 1 details the additive manufacturing equipment, the device with CNC coordinates, and the welding machine.

Figure 1: Additive Manufacturing Machine



Source: From the author (2024).

As can be seen in Figure 1, the equipment has movement in three axes, X, Y, and Z, longitudinal and vertical transverse, respectively. Programming is carried out through the MACH 3® software, in programming language G. However, the welding equipment has a data acquisition tool for voltage (V), current (A), wire-speed (m/min.), gas flow (L/min.), and power (W) among other parameters.

METALLOGRAPHY TESTING

An Olympus SC30 microscope was used to analyze the constituents according to ABNT NBR 15454. The acid used to reveal the phases present in the metal was vital at 2% for 10 seconds.

VICKERS MICROHARDNESS TEST

The Vickers microhardness test in profile was performed for mechanical evaluation. For this purpose, a SHIMADZE® microhardness tester, model HMV-2TADW, was used. The applied load was 4.903 Newtons with an application time of 10 seconds for the sample nucleus. The first indentation was performed at the end of the welded wall, using a load of 2.943 Newtons, according to the ABNT NBR NM ISO 6507 standard.

BASE MATERIAL

To present characteristics compatible with the wires under study, SAE 1020 steel was adopted as the base metal. The sheet has the following dimensions; 150 x 75 x 6.35 mm. The use of optical emission spectrometry, as described in item 2.1 for chemical characterization, is noteworthy.

RESULTS

SPECTROMETRY FOR SAE 1020 STEEL AND ER70S-6 AND E71T-1 WIRES

As shown in Table 3, the carbon content for both materials is similar, which justifies the application of the SAE 1020 base material.

Table 3: Chemical composition ER70S-6 and SAE 1020.

Element	ER70S-6 (%)	SAE 1020 (%)	E71T-1C (%)
Carbon (C)	0,104	0,107	0,063
Silicon (Si)	0,657	<0,0050	0,649
Manganês (Mn)	1,259	0,465	1,443
Phosphorus (P)	0,014	0,016	0,0051
Sulphur (S)	0,010	<0,0030	0,0057
Chromium (Cr)	0,020	0,020	0,027
Molibdênio (Mo)	0,014	0,0096	0,014
Copper (Cu)	0,093	0,0045	0,0067
Iron (Fe)	Ball.	Ball.	Ball.

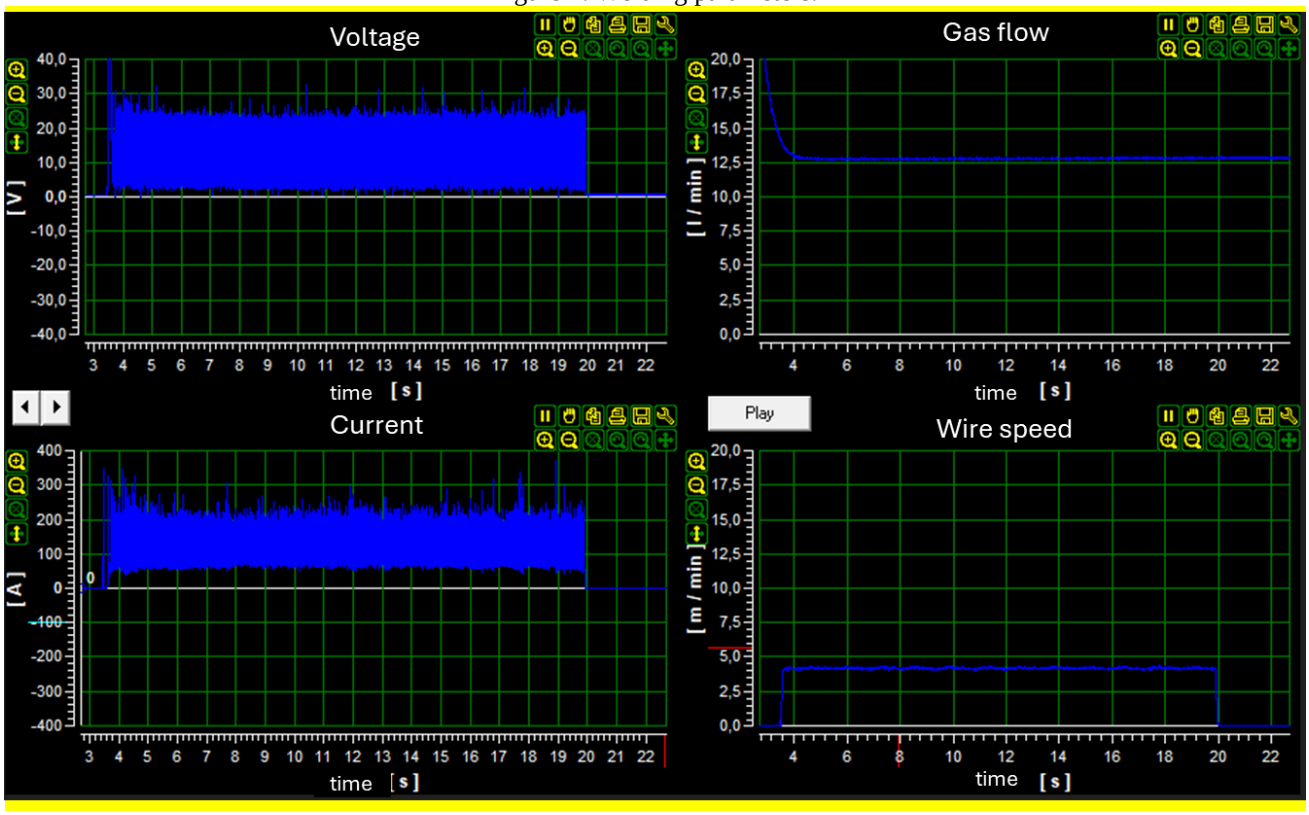
Source: From the author (2024).

Other components are part of the structure of these materials, especially the use of manganese as a deoxidizer and desulfurizer. When manganese is present in concentrations below 1%, it does not negatively affect weldability, although it can increase the hardness of the material. At concentrations greater than 1 %, manganese can increase the propensity to crack during the welding process. [15] [16] [17].

SAMPLES MANUFACTURED BY ADDITIVE MANUFACTURING

First, the parameters of the wire in question were adjusted. Figure 2 details the parameters used to manufacture the samples.

Figure 2: Welding parameters.



Source: From the author (2024).

The mean for the welding parameters are presented in Table 4.

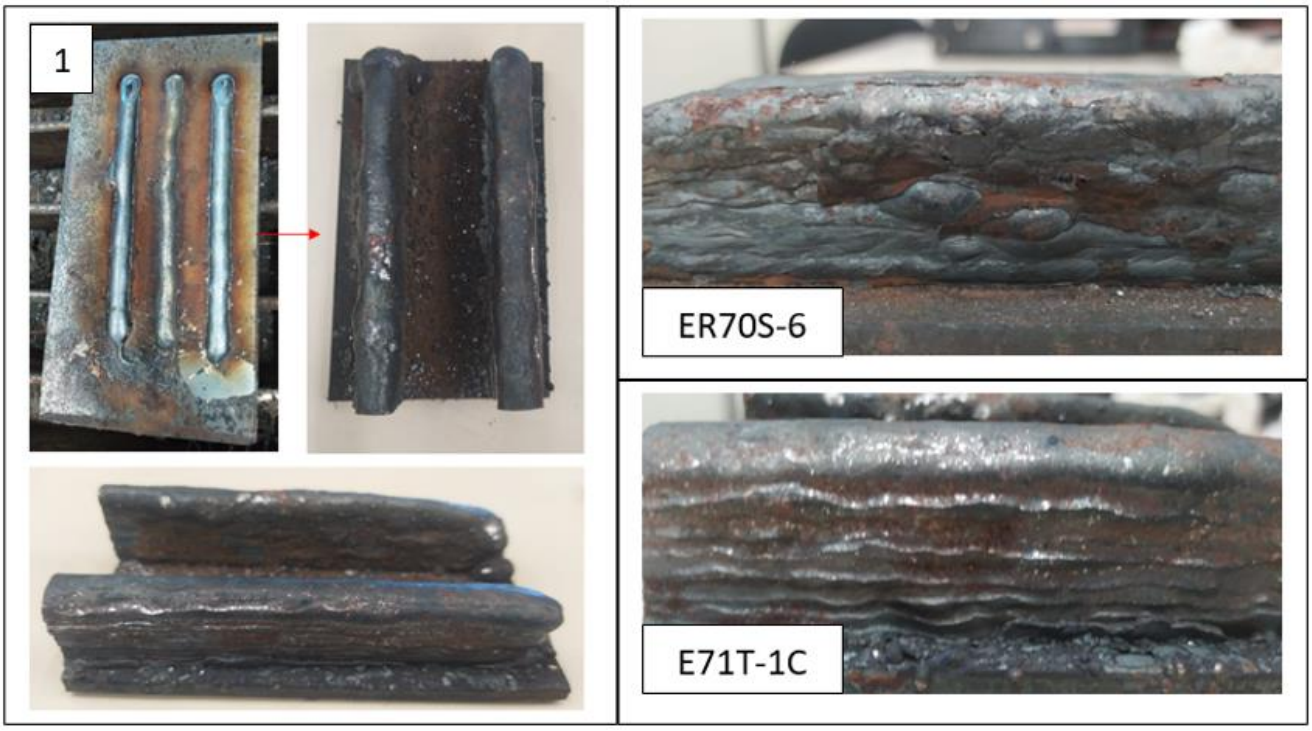
Table 4: Welding parameters.

Parameter:	ER70S-6:E71T-1C:	
Current (A)	131	168
Voltage (V)	18,2	19,9
Gas flow rate (L/min.)	12,3	13,4
Wire speed (m/min.)	4,8	6,1
Argon (%)	85	85
Carbon dioxide (%)	15	15
CNC Displacement (mm/min.)	300	300

Source: From the author (2024).

The manufactured wall is approximately 130 mm long, 25 mm high, and 12 mm thick. The impression was performed with a double cord laterally. The increment for each pass, i.e., the value that the machine shifted vertically to each layer, was approximately 2.8 mm, totaling 9 layers. Figure 3 shows the sequence of sample production, which begins with the adjustment of the parameters (1) until the final print.

Figure 3: 3D Printing



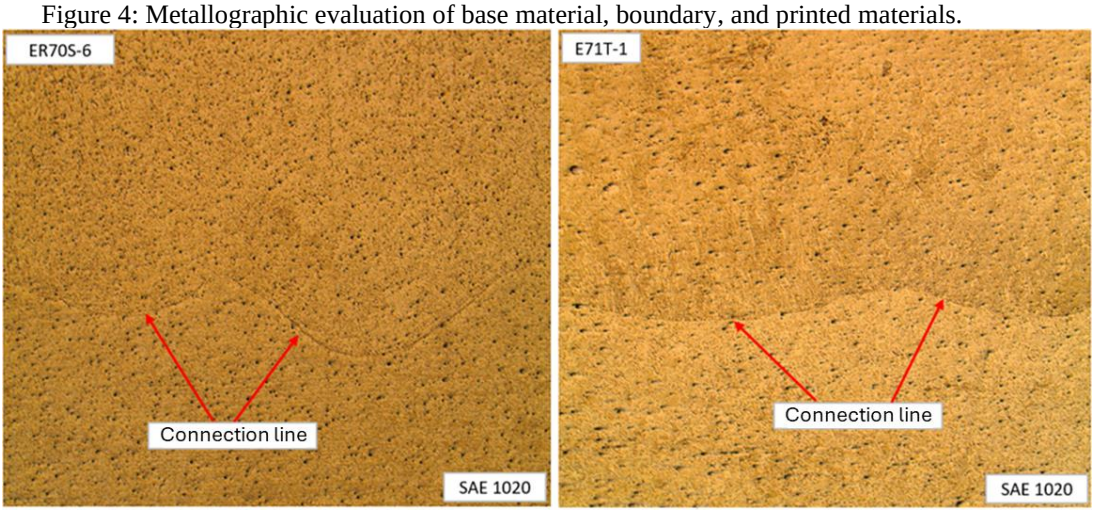
Source: From the author (2024).

After the fabrication of the samples, they were cut and ground on a band saw from the manufacturer Franho model FM 18S and a flat grinding machine from the manufacturer Mello model P36, respectively.

METALLOGRAPHIC TESTING

Figure 4 shows the connection zone between the SAE 1020 steel base metal plate and the materials printed by additive manufacturing. In the twelve-fold magnification image, it is possible to observe that for ER70S-6 wire, penetration into the base metal was greater, however, for E71T-1C wire the penetration was reduced. This phenomenon is because the chemical elements present in SAE 1020 steel and ER70S-6 wire have closer contents, compared to E71T-1C wire, thus explaining the equivalent penetration values.

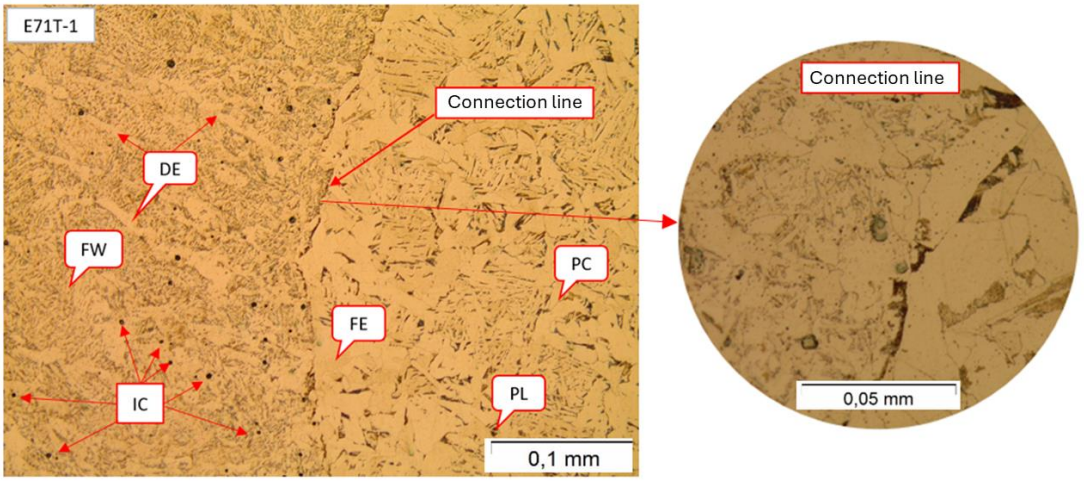
Figure 4: Metallographic evaluation of base material, boundary, and printed materials.



Source: From the author (2024).

Figure 5 shows in detail the structures for the base plate, contact surface, and deposited material. The following elements can be observed: Ferrite (FE), Perlite (PL), Grain Boundary Perlite (PC), Inclusion (IC), Dendrite (DE), and Widmanstätten Ferrite (FW).

Figure 5: Contact surface between SAE 1020 steel and E71T-1C wire.

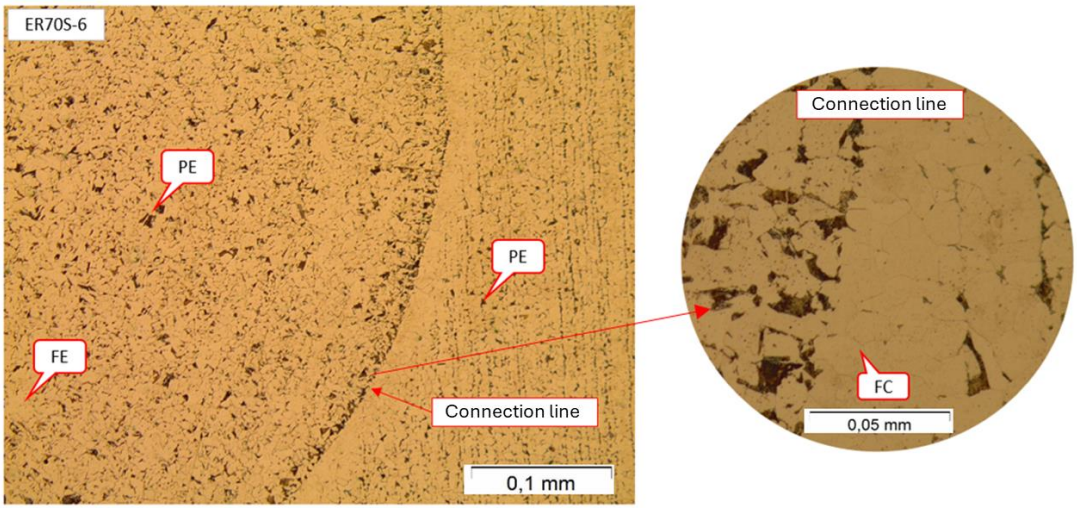


Source: From the author (2024).

It can be seen in Figure 5 that the base material (SAE 1020) is composed of the microstructure ferrite and the microconstituent pearlite, however, ferrite is predominant in the matrix because it is low-carbon steel. However, on the bond line, it is possible to visualize the carbon precipitation from the base metal to the welded metal. In the case of the deposited material E71T-1C, it presented a significant amount of pores during the printing process. According to Duarte et al (2024), when there is a subsequent layer of welding such as AM, the material recrystallizes, however, due to the high temperatures, residual stresses and inclusions are present in the printed samples [18]. The material deposited in the first layer has dendrites, caused by the rapid cooling process, as well as Widmanstätten ferrite, characteristic of the welding process.

Figure 6 details the metallography for ER70S-6 wire, where this material demonstrated carbon precipitation to the contact surface. However, it has a similar structure compared to the base material, since the material deposition region is composed of the ferrite phase and the microconstituent perlite.

Figure 6: Connection line between SAE 1020 steel and ER70S-6 wire.



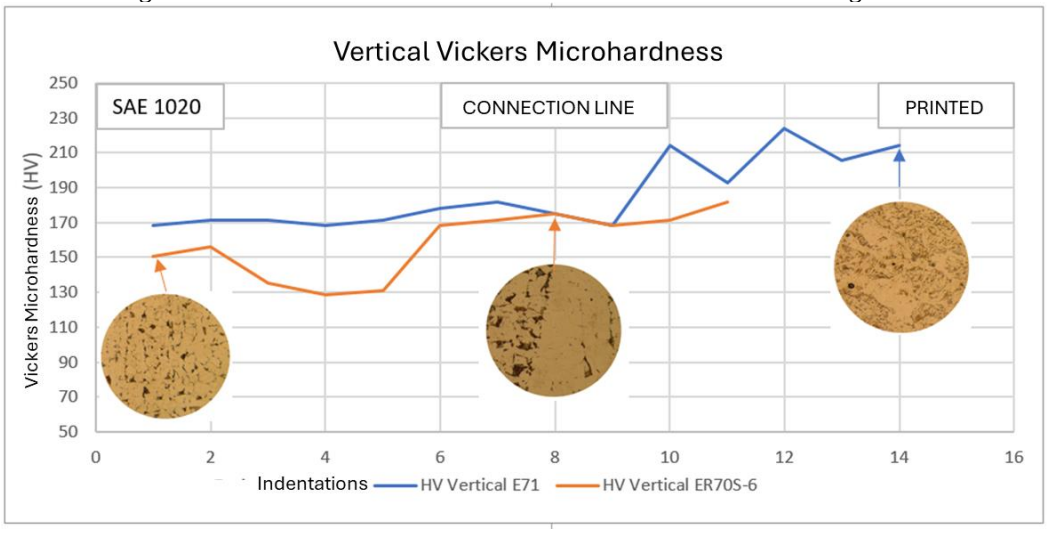
Source: From the author (2024).

A greater amount of ferrite is observed in the connection line, due to the carbon precipitation for the deposited material, and thus the grain boundary ferrite stands out, as shown in Figure 6.

VICKERS MICROHARDNESS TEST

Figure 7 shows the results pertinent to the microhardness evaluation. In this test, the measurements started in the base material (SAE 1020), presenting a microhardness of 150 and 169 HV. For the bonding region, the microhardness was measured with approximately 175 HV. When arriving at the printed material, the value for E71T-1C wire was up to 224 HV, and for ER70S-6 wire 182 HV.

Figure 7: Microhardness SAE 1020 steel and Additive Manufacturing wires.

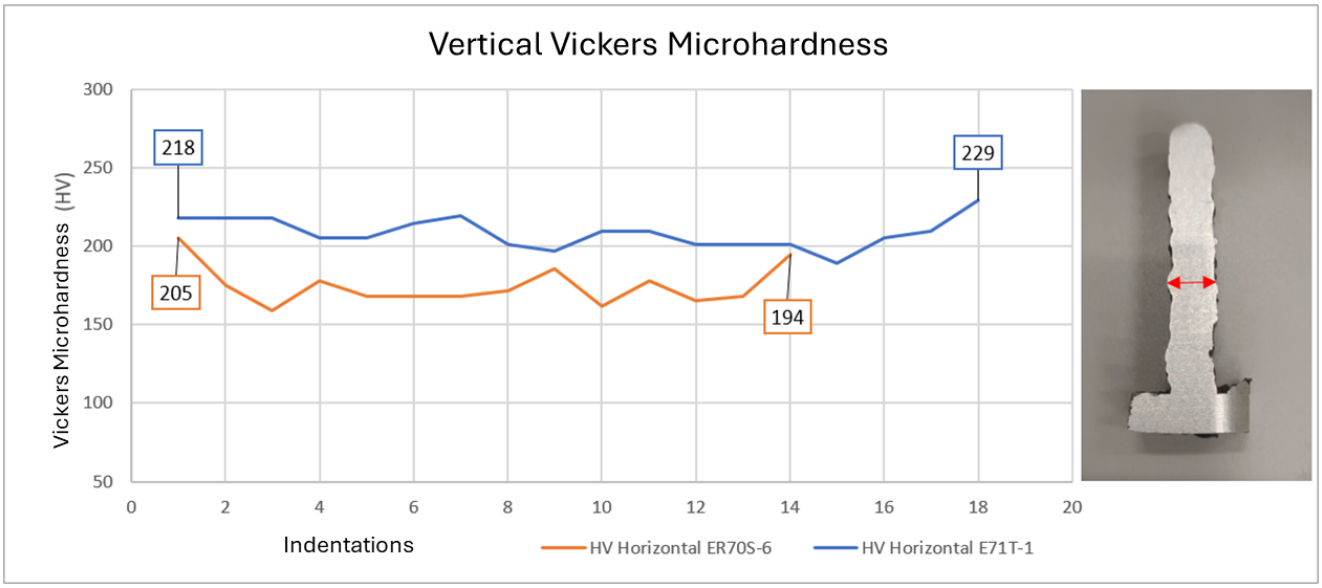


Source: From the author (2024).

Figure 8 shows the results for Vickers microhardness perpendicular to the deposition. The objective is to evaluate the hardness between the ends and the core of the deposition and to evaluate the effects of thermal exchange with the external environment.

In the graph, it is evident that the first indentation at a distance of 0.1 millimeter from the end, has greater hardness, as shown in Figure 8. For the ER70S-6 material, the first measurement at the left and right ends was 205 and 194 HV, respectively. However, after the first measurement, the microhardness is reduced and remains at an average of 171 HV ± 7.

Figure 8: Microhardness SAE 1020 steel and Additive Manufacturing wires between walls.

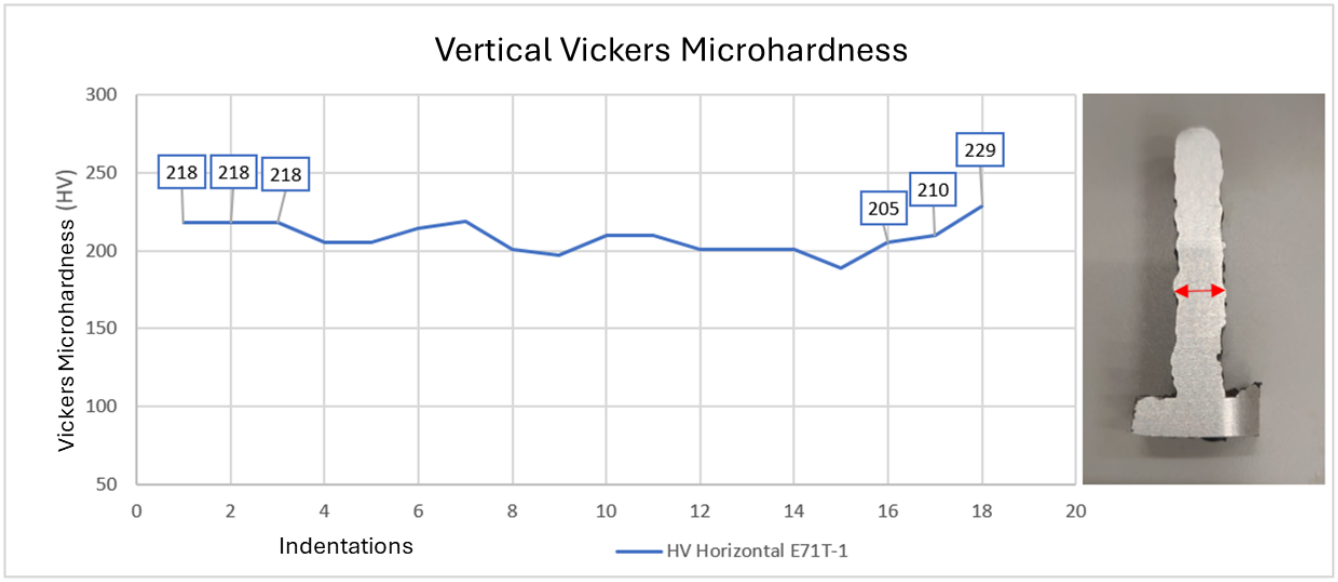


Source: From the author (2024).

The E71T-1C wire showed greater uniformity, however, the ends of the wall obtained higher measurements compared to the core, with 218 and 229 HV. However, this wire showed a different

behavior, as it obtained a reduction in hardness after the third indentation, that is, after 0.3 millimeters from the end, as shown in Figure 9.

Figure 9: Microhardness E71T-1C between walls.



Source: From the author (2024).

CONCLUSION

After metallographic evaluation, it was possible to verify that for the contact surface between the materials, there is carbon migration from the base metal to the deposited material, however, the migration layer is very close to the base, which can be eliminated by separating the printed part from the base metal.

When it comes to the microhardness evaluation, the E71T-1C wire was more influenced by the temperature at the end of the wall, with a microhardness 17 % higher than the core. For the ER70S-6 wire, the increase was 11% in the same region.

However, the E71T-1C wire maintained this increase in hardness by approximately 0.3 millimeters, while the ER70S-6 wire by 0.1 millimeters.

Thus, when evaluating the microhardness between the two wires in the deposition region, the results were 224 and 184 HV for the wires E71T-1C and ER70S-6, respectively. The increase in microhardness may be linked to the amount of manganese associated with chromium present in each material studied, since the amount of carbon for the ER70S-6 material is higher about E71T-C1, however, the microhardness values were reversed.

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Historical evolution of chromatographic methods for the determination of endosulfan and its metabolites in water samples

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Felipe Cury Mazza[1], Nilo Antônio de Souza Sampaio[2] and Carin Von Mühlen[3]

ABSTRACT

Endosulfan is a highly toxic, broad-spectrum insecticide. Alpha-endosulfan, Betha-endosulfan, and their metabolites are on the Stockholm Convention on Persistent Organic Pollutants list. Endosulfan metabolites exhibit a wide range of chemical characteristics resulting in hard work for chemical analysts to specify all known degradation products of this insecticide in environmental matrices. This manuscript reviews the evolution of analytical methods related to the determination of endosulfan and its metabolites in environmental matrices. Specific metabolites, such as endosulfan alcohol, have very different physicochemical properties from the parent compound, so the use of a single satisfactory extraction method for endosulfan and its metabolites has not yet been achieved. Also, new endosulfan metabolites have recently been added to the list of their degradation products. The determination of these compounds in multi-pesticide analytical methods over the years was also discussed.

Keywords: Evolution of analytical methods, Organochlorine pesticides, Trace analysis, Two-dimensional gas chromatography, Water extraction.

[1] PhD in Environmental Engineering
[2] PhD in Mechanical Engineering
[3] PhD in Chemistry

INTRODUCTION

Endosulfan is a highly polluting and toxic pesticide, which has been used in many areas globally to control insects and mites and improve productivity. Concomitantly, endosulfan has also been associated with many cases of environmental pollution and various types of irreversible metabolic dysfunctions in living organisms both on soil and in water [1, 2]. The use of endosulfan has been banned or is strictly restricted in a number of countries. Its isomers and endosulfan sulfate were added to the Stockholm convention list of persistent organic pollutants to eventually complete elimination of endosulfan use [3].

The toxic effects of endosulfan and its metabolites to the environment added to its persistency, justifies the great concern of scientific community and steak holders for the monitoring of those compounds in different environmental matrices in the globe. The biggest challenges in the development of reliable analytical methods are the chemical variability of endosulfan metabolites and the extremely low concentration range of the degradation products. Some metabolites, such as endosulfan alcohol, have very different physicochemical properties from the parent compound so that the use of a single satisfactory extraction method for endosulfan and its metabolites has not yet been achieved [4-7]. In addition, recently new endosulfan metabolites were added to the list of their degradation products [8]. Endosulfan alcohol is a nontoxic metabolite to fish and other organisms. It can be further degraded to non-toxic endosulfan ether, endosulfan hydroxy ether, and endosulfan lactone [9].

Extraction methods are general focused on multi-residue determinations, using traditional clean-up methods, such as SPE, liquid-liquid partition extraction, [10] and matrix solid-phase dispersion extraction, [11] presenting low selectivity. It is essential to develop an effective method for the determination of endosulfan and its metabolite residues in environmental samples [12].

As a semi-volatile molecule, endosulfan is also a chlorinated and sulfur-containing compound. Those properties historically directed the analysts to the use of gas chromatography with selective detectors such as electron capture detector - ECD or flame photometric detector - FPD [13-15]. The use of mass spectrometric detectors and hyphenated techniques was also significantly employed such as GC-MS/MS [16-17] and comprehensive two-dimensional gas chromatography with time-of-flight mass spectrometry – GC×GC/TOFMS [18,19] improved the molecules confirmation for multi-residues determinations.

This review presents the evolution of analytical methods for the determination of endosulfan and its metabolites in the water matrix. It discusses extraction techniques and chromatographic methods limitations highlighting directions for further studies.

ENDOSULFAN

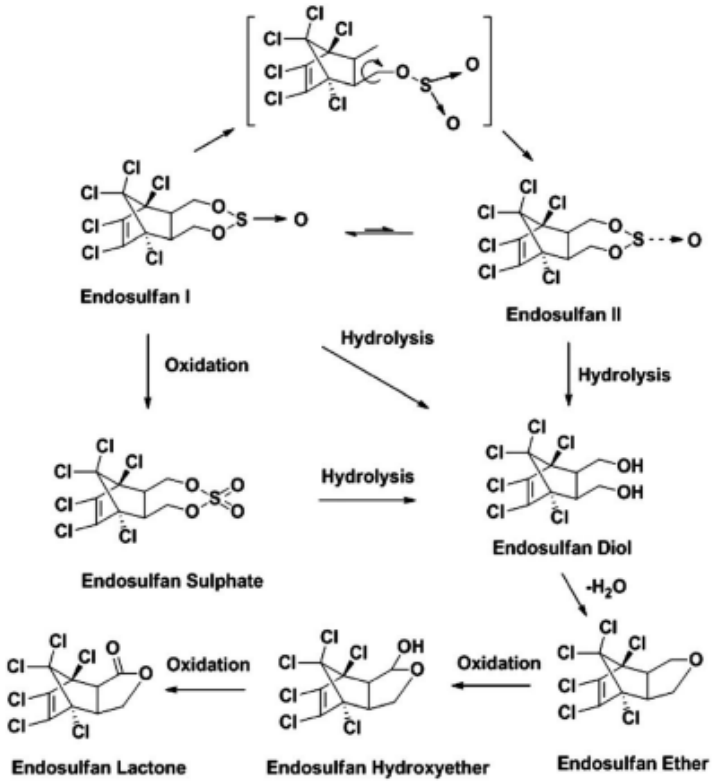
Endosulfan is a polychlorinated manufactured insecticide (CAS register number 115-29-7), first introduced in the 1950s [20]. It was widely used to control several insects on various agricultural products, such as grains, tea, fruits, vegetables, tobacco, and cotton. Endosulfan became a highly controversial agrichemical. Endosulfan has been considered an endocrine disruptor [21, 22]. It has also been attributed to adversely affecting human health in many ways, for example, by impacting human primary hepatocytes, inducing seizures, cancer development, reproductive system disorders, gastrointestinal diseases, and physiological disorders [2, 23]. Endosulfan has been identified as a cause of occupational poisoning in both developing and developed countries [24-25].

In the environment, soil or water, both endosulfan isomers are slowly degraded to endosulfan sulfate and then to other products such as chloride ions [26]. Many studies have demonstrated that endosulfan can provoke acute and chronic symptoms to fish, such as increase in mortality, no growth or reproduction, genotoxicity, and mutagenicity [1,27]. The eco-environmental behavior of endosulfan has raised great concerns because of the negative changes in biota [28-30]. As a result, the production and use of endosulfan has been discontinued in more than 60 countries, but it still in use for specific cultures in several nations, like China, India, Iran, Pakistan, Bangladesh and others [31-32].

For the chromatographic separation of endosulfan it is important to analyze its molecular structure. Endosulfan is actually a mixture of stereoisomers, called α and β. α-Endosulfan is more thermodynamically stable, while β-endosulfan is irreversibly converted to α form at room temperature [33].

The derivations of endosulfan as published by Reddy Mudiam et. al. [4] can be represented in figure 1.

Fig. 1 – Derivations of the endosulfan



Source: Reddy Mudiam et. al. [4]

The first chromatographic studies with endosulfan found in the literature dating from 1958[34], where Neiswander studied the mass transfer of the endosulfan from the soil to the air, mainly in the ether form. Since then, endosulfan has been found in various environmental compartments, including air, soil, vegetation, and water [35]. Endosulfan often enters the environment at the locations where it was directly applied. Endosulfan is one of the most commonly detected pesticides in surface water in the USA and is one of the most abundant organochlorine pesticides in the air [36]. Endosulfan is less persistent than other organochlorine pesticides in the environment, but the half-lives of the toxic components of endosulfan (α-endosulfan, β-endosulfan, and endosulfan sulfate) being between nine months and 6 years [37,38].

EXTRACTION METHODS APPLIED TO ENDOSULFAN AND ORGANOCHLORINE PESTICIDES

Many methods or variations of methods are used to extract pesticides from non-liquid samples for residue analyses. Soxhlet extraction has been widely used since the 1960s for the analysis of air (fiberglass filters), soil, and sediment containing chlorinated pesticides. Nash et.al.[39] compared the extraction efficiency of chlorinated hydrocarbon insecticides from soils using three methods: agitation, soxhlet, and column extraction. Column extraction was faster than soxhlet or shake and did not require heat as soxhlet extraction. However, column extraction was less efficient

than soxhlet extraction for DDT residues. Hesselberg and Johnson [40], obtained 96 to 100 percent recovery of organochlorine insecticides in fish samples, advocating the use of extraction columns.

Mixing of solid samples with organic solvents followed by filtration and combination of reagents in several stages, such as sulfate and sodium chloride, was very common in the 1970s. The solid-liquid extraction described by some authors, speeded up the mixing with a blender and subsequent filtration in a Büchner funnel. The filtrate was transferred to a separatory funnel and mixed with other reagents, homogenized and then concentrated in a Kuderna-Danish concentrator or rotary evaporator [41-43].

In the 1980s, solid phase extraction (SPE) of organic components from water solution, octadecyl (C_{18}) bonded porous silica started to become the most popular. Schneider, Bourne & Boparai [44] and Jimenez, Atallah & Bade [45] used to determine chlorinated pesticides and PCBs with recovery between 73 to 100.7%.

In the same decade, microwave irradiation started to be introduced (sonication extraction) to the extraction of various types of compounds from soil, seeds, foods and feeds as a novel sample preparation method for solid samples. In comparison with the traditional soxhlet technique, microwave extraction was presented as more effective regarding the yield of the extraction and the protection of the compounds to be analyzed. The method was suitable for the rapid extraction of large sample series [46,47], but not yet used for pesticide extraction. Schäfer and Baumann [48] used supercritical fluid extraction in the determination of pesticides obtaining between 90 and 100% recovery. However, soxhlet extraction and mixing of solid samples with organic solvents still with its permanent use in research.

In the next decade, sonication extraction became a classical extraction method such as soxhlet extraction in environmental laboratories. Other extraction techniques are still under development and discussion by the researchers. Snyder et. al. [49] used supercritical fluid extraction for soil samples, achieving average recoveries of 91.16% compared to soxhlet (89.16%) and sonic probe extraction (91.66%) of organochlorine pesticides statistically evaluated at the level of 95% confidence. Lopez et. al. [50] compared microwave-assisted extraction (MAE), Soxhlet, sonication, and supercritical fluid extraction (SFE) for sediment and soil samples with recoveries of 94 compounds. Soxhlet and MAE had recoveries greater than 80% for 50 and 51 compounds while sonification 63. Only SFE had 37 compounds above the mentioned recovery. The main advantages of MAE are shorter extraction time (typically 10 min for extraction and 40 min for cooling, centrifugation, and concentration) and less use of solvent.

Heemken et. al. [51] used accelerated solvent extraction (ASE) for determination of organic micropollutants in marine particulate matter in comparison to SFE, soxhlet, sonication, and methanolic saponification extractions. Using SFE, the average recoveries ranged from 96 to 105%

while for ASE the recoveries were in the range of 97-108% compared to the others methods, with the majority of the compounds within the confidence limits. The use of the SPE technique was not only in water samples. Redondo et. al. [52] applied SPE for soil samples, using sonication with water and acetone obtained between 56 to 100% recovery.

For water samples, the most used method was SPE using C_{18} cartridges. Solid phase micro-extraction in the 90s became popular among several researchers for both air, water, juice, fruit, and vegetable samples [53-55]. The new micro-extraction method was developed by Arthur and Pawliszyn [56].

Magdic, S., and Pawliszyn [53] have outlined the successful development of a method based on the SPME technique for the analysis of organochlorinated pesticides from aqueous samples. The fiber selected for the analysis of the organochlorines was a fused-silica rod 1 cm long, coated with 100 µm of polydimethylsiloxane (PDMS). The method is precise, reproducible, and linear over a wide range. The detection limits obtained for the SPME method using either ECD or MS are comparable, if not better than those required by US EPA methods 508, and 625 respectively.

Entering the 21st century, a novel extraction technique for aqueous samples namely stir-bar sorptive (SBSE) was introduced in 1999 by Baltussen et. al. [57]. Bicchi et. al. [58] analyzed in pear pulp (a heterogeneous matrix) by extraction on polydimethylsiloxane stir bar (SBSE) followed by recovery through thermal desorption (TD). Pesticide recoveries at different levels were quite homogeneous and all above 70%, with the exception of chlorthalonil whose average recovery was 32.1%.

To analyze pesticide residues in solid samples, a rapid and inexpensive approach was reported by Anastassiades et. al. [59], coming back to the solvent extraction procedures of the 70s. The authors named this method QuEChERS which stands for *Quick*, *Easy*, *Cheap*, *Effective*, *Rugged,* and *Safe*. Lehotay et. al. [60] conducted the method for the determination of 229 pesticides fortified at 10–100 ng g^{-1} in lettuce and orange matrixes. Recoveries for all but 11 of the analytes in at least one of the matrixes were between 70–120% (90–110% for 206 pesticides), and repeatabilities typically <10% were achieved for a wide range of fortified pesticides. Despite the trend towards fast and less wasteful methods, the oldest methods are still used in research and routine laboratories.

HISTORICAL EVOLUTION OF ANALYTICAL METHODS FOR ORGANOCHLORINE PESTICIDE DETERMINATION IN ENVIRONMENTAL MATRICES

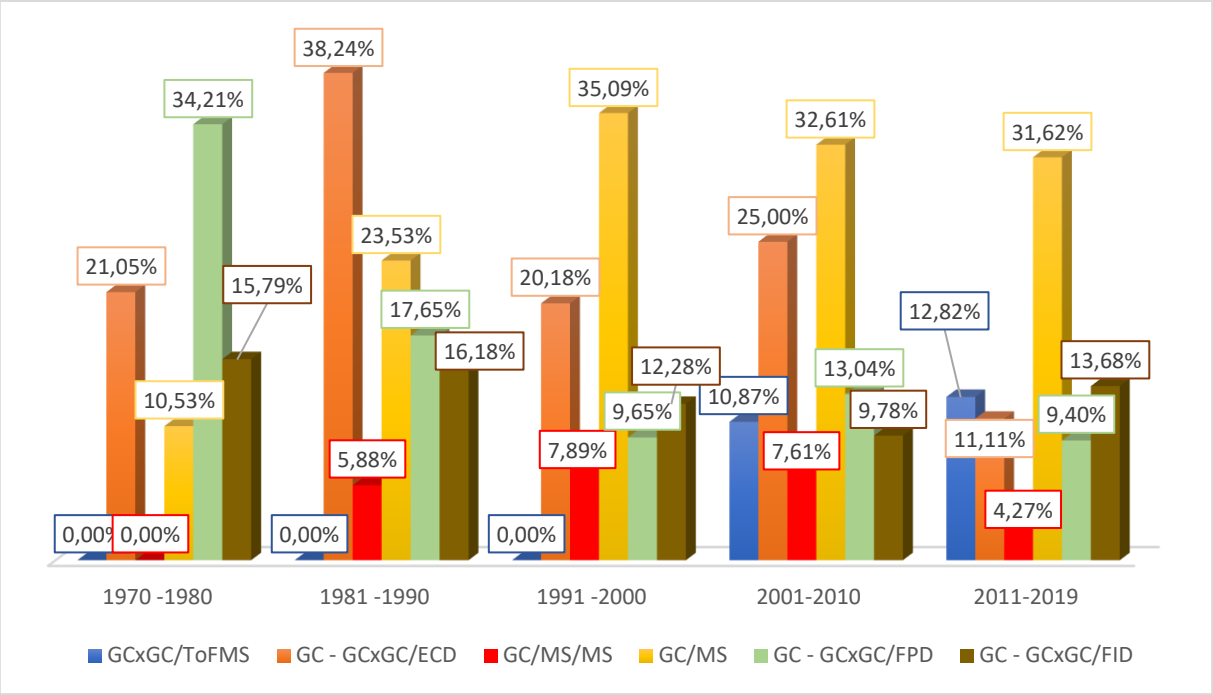
The evolution of analytical methods applied to endosulfan determination came along with the evolution of chromatography. After paper chromatography, a very simple and highly sensitive detector was developed in 1955 by Scott [61] and based on the combustion of organic compounds present in the column effluents in a hydrogen flame in an atmospheric environment and on the

measurement of the temperature variation of the flame during combustion. From this detector, two new detectors were created in 1958. The FID flame ionization detector, widely used in the 1970s, and the argon ionization detector. The argon ionization detector is a creation of Lovelock [62], who was the first to show that a normal beta ionization detector, when used with argon as a carrier gas, creates metastable argon atoms that collide with the vapor molecules and transfers their excitation energy. However, the modifications of the original argon detector, the so-called electron capture detector (ECD), proved to be very important in selective analysis. FPD and ECD were popularized in the 60´s, but still important today [63].

In 1961, the flame photometric detector (FPD), was first used in gas chromatography for the visual detection of chlorine-containing substances. In 1964, Huyten and Rijnders [64] constructed a FPD with a photomultiplier for the determination of halogens. Juvet and Durbin present a more detailed characterization of the operation and performance of the flame photometric detector as applied to certain metal chlorides, metal chelates, organic compounds, and phosphorus and sulfur-containing pesticides [65]. In 1965, electron capture gas chromatography was applied to chlorinated insecticides in milk. With an improved cleanup method, it was possible to quantify DDT, DDE, lindane, dieldrin, heptachlor, heptachlor epoxide, and endrin [66]. In 1966, using the same cleanup procedure, endosulfan required 800 and 1,000 ml for the elution of its two isomers with 85% recovery [67].

More than 500 authors were considered in the survey of techniques used to determine pesticides in environmental matrices only, such as soil, sediment, air, water, and biota. The literature presents a transition of the tendency for application of different analytical techniques over the decades, since 1970, as presented in Figure 2. In the 70s, the best available technology in analytical labs to deal with endosulfan environmental analysis was still GC-FPD. The flame photometric detector (FPD), lost space for GC-ECD, GC-MS over the decades. While GC-ECD was the most applied technique in the 90s due to its selectivity and lower detection limits, this tendency was overcome by the development of more sensitive mass spectrometry detectors, and the higher selectivity associated with MS/MS platforms, applied with GC.

Fig. 2 – Analytical techniques employed for organochlorine pesticides in environmental matrices



Mass spectrometry (MS) has an additional advantage because it is not only for quantification but also for the identification of pesticides in complex samples [68]. Suspicious screening processes tailored for gas chromatography coupled with high-resolution mass spectrometry (GC-HRMS) have been used to identify novel compounds of concern [69-70].

The ability of the MS detector to perform tandem mass spectrometry (MS-MS) promotes pesticide analysis at low picogram levels, even in the presence of interference, significantly reducing background noise [71]. However, along with the increase in the number of organic contaminants in the environment, measurement is traditionally complex and tedious and, more importantly, more expensive, as standard chemicals are expensive and may be a cause of declining use. The popularity of high-resolution mass spectrometry (HRMS) instruments has importantly grown mainly due to the availability of time-of-flight (TOF) and Orbitrap systems at affordable costs. The major advantage of these mass spectrometers is the possibility of acquiring full-scan spectra at high resolution, whereas Triple Quadrupole Mass Spectrometer (TQMS) techniques only register selected or multiple reaction monitoring (SRM or MRM) data defined by the user before the analysis [72].

Currently, GC×GC/TOFMS is widely used to investigate the presence of a large number of contaminants in samples due to their complementary characteristics to determine from nonpolar/ volatile to polar/nonvolatile compounds. Reasonable sensitivity to full spectrum acquisition and accurate mass data provided by TOFMS allow for a noticeable increase in the number of compounds to be investigated, with the possibility of subsequent search for additional compounds in a retrospective analysis without the need for further sample injections [73]. Its growing use in pesticide samples was started in the year 2000.

Over the decades, new technologies and enhancements, have left the right side of techniques that are now less used today. The quantification of pesticides and their major metabolites has been performed in multi residue analytical methods, along with other pesticides.

GAS CHROMATOGRAPH ELECTRON CAPTURE DETECTOR GC-ECD

Since the 60's, gas chromatography has been considered one of the most frequently used methods in the analysis of pesticide chemicals in environmental samples [15, 74-77]. The ECD detector is probably the most sensitive and selective of the traditional GC detectors available and is widely used in the detection and analysis of high electron affinity compounds [78].

ECD detector has long been recognized as the detector of choice for trace analysis of halogenated organic compounds such as organochlorine pesticides, herbicides, and halogenated hydrocarbons in a range of samples. It uses a radioactive beta (electron) emitter to ionize some of the carrier gas and produce a standing current between a biased pair of electrodes. Containing electronegative functional groups, such as halogens, phosphorus, and nitro groups, some organic molecules have electrons captured by the detector which reduce the current measured between the electrodes. ECDs have been used successfully for the detection of various compounds, including hazardous substances [79-81].

In 1969, Chau [74] had identified in a 10 g sample plant material, 0.03 ppm or more of the parent insecticide endosulfan in a time run of 20 min using GC-ECD. The column was a 1 + 1 mixture of 4 % DC-11 and 6% QF-1 on 60-80 mesh acid-washed Chromosorb W in a 31.75 mm id × 12.7 cm glass column. In the following two decades, chromatographs analyzed organochlorine and phosphorous pesticides through non-polar packed GC columns such as OV-1, SE-30, QF-1, OV-17, and CP-5, with a majority of 80-120 mesh. The number of analytes was limited to less than 15 compounds and the analysis time was relatively long [43, 82-87].

In the 1980s, the migration from packed column chromatography to capillary columns with similar stationary phases was observed. Known as high resolution capillary columns, they can be useful in applications that require high analysis speed. Schneider, Bourne & Boparai, Seymour et. al., Bidleman et. al., Buchert, Class & Ballschmiter, and Jimenez, Atallah & Bade used capillaries columns between 30 and 60 m long with diameter from 0.1 to 0.32 mm and thickness film 0.1 to 0.25 µm [44-45, 88-90].

In addition, a small volume electron capture detector cell has been described by Wells [91], that is compatible with columns of internal diameters as small as 100 microns. The unique method of transporting the sample through the active region of the cell allows the use of hydrogen as a carrier gas without sample loss by adsorption on surfaces activated by the hydrogen. The combination of short, narrow columns and hydrogen carrier gas allows reduced analysis times.

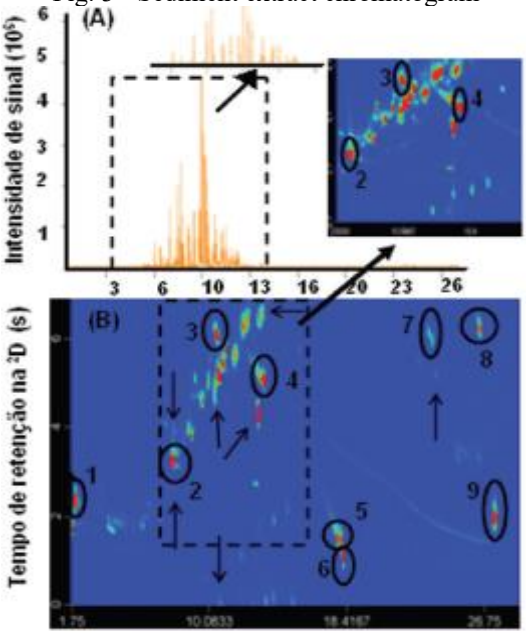
In the 90s, pesticides research such as Jiménez et. al., Hajslová et. al., Albanis et. al. already present multiresidual analyzes of pesticides [53, 92-94]. The analysis time is usually more than 40 min, and can be shorter or much longer. Long chromatographic columns (e.g. 60 m x 0.25 mm I.D. and 0.25 µm film thickness) are preferably used, however, columns with other dimensions can be found. The stationary phase found is often non-polar DB-5 (5% phenyl, 95% methylpolysiloxane) and HP-1 (100% methylpolysiloxane), as well as HP-50 mid-polarity (50% phenyl, 50% methylpolysiloxane).

In addition, the new ECD was designed to address inherent deficiencies in classical electron capture detectors (ECD), especially with respect to sensitivity, linearity, dynamic range, and ruggedness. The improved performance of Micro-ECD met all CLP criteria for the analysis of OCP over a period of 6 months. System validation was performed throughout this period for a wide variety of samples and analyses of different EPA methods. Micro-ECDs showed improved sensitivity, greater dynamic and linear operating ranges, more stable response, required minimal maintenance, and showed rapid recovery after switching between methods [95]. The micro-electron capture detector (µECD) has a much smaller inner volume than classical ECDs and is an excellent detector for quantitative analysis and screening of polyhalogenated organics by GC×GC [79, 96]. Also, according to von Mühlen et. al., µECD shows a variable sample rate from 5 to 50 Hz, suitable for rapid chromatography and minimizing the chance for contamination in the anode.

In the first decade of the 20th century, most of method development using GC-ECD was focused on reduction of analysis time, in order to improve the sample throughput. Oviedo et.al., Domotorová et. al., Vagi et. al., Khummueng et.al., and Kim et. al. obtained the separation of 9 to 17 compounds in 15 to 25 min run [97-101]. Borga et. al. injected aliquots of organochlorine extract into two identical GC-ECDs equipped with capillary columns of different polarity [102]. The detection limit of compounds ranged from 0.002 to 0.365 ng g^{-1} of wet weight. The compound-dependent detection limit decreased to 0.003 to 0.078 ng g^{-1} wet weight, equipped the GC with a Ni-micro-ECD.

The combination of comprehensive two-dimensional gas chromatography with the µ-ECD detector expanded the compound scan and reinforced the improvement. Khummueng et. al. and Korytár et. al. used GC×GC to analyze more than 40 pesticide analytes [100, 103]. According to Silva et. al. the analysis of sediments by GC×GC in relation to the 1D-GC allows the separation of the 8 pesticides with less probability of interference from constituents of the matrix [104]. The greater potential of the GC×GC technique was evident for the separation and quantification of organochlorine compounds. Regarding the analysis time, the two methodologies are practically equivalent, with 27.9 min for 1D-GC and 29.4 min for GC×GC (figure 3).

Fig. 3 - Sediment extract chromatogram

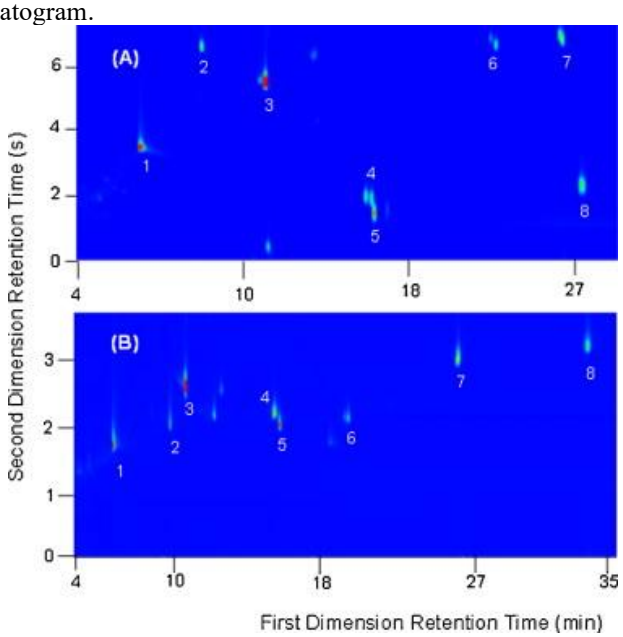


Source: Silva et. al. [104]

The detection limits found by Silva et. al. also were 0.60 to 2.31 µg L^{-1} to 1D-GC and 0.08 to 1.07 µg L^{-1} in GC×GC to sediment sample showing performance improvement.

As an early development stage of GC×GC, the authors used to evaluate different column configurations and stationary phases for different applications (figure 4). Researchers used column stationary phases such as 5% methyl silicone in the first dimension combined with (DB-5, non-polar), polyethylene glycol (polar) in the second dimension, 6 - 14% cyanopropyl-phenyl -methyl polysiloxane (example DB-1701, low/mid-polarity) and DB-17 (similar to HP 608 - mid polarity). The diameter of the column and the film varied considerably in each survey and in some surveys, they already work with columns shorter than 30 m [105].

Fig. 4 - GC × GC-μECD color plots for a 100 μg L^{-1} solution of the pesticides. (A) DB-5/DB-17ms column set, (B) HP-50+/DB-1ms column set chromatogram.



Source: Silva et. al. [105]

The DB-5/DB-17ms column provided better analytical results compared to HP-50+/DB-1ms as analysis time was shorter (29.4 min and 35.7 min, respectively) and the resolution was better for permethrin isomers (6) (Rs = 0.72 versus Rs = 0.36) Resolution between propiconazole (4) and trifloxystrobin (5) was 0.6 for both column sets. Potential of the application of GC×GC-μECD was demonstrated for better separation between analyte and matrix interference, minimizing the possibility of coelutions.

The evolution of GC-ECD method development and application in the last 18 years is presented in Table 1. The application of GC×GC-ECD for pesticide analysis in the second decade of the 20th century was directed to the diversification of the type of samples, with small variations between column configurations and analysis time [106, 107]. The analysis time continues on average between 30 and 50 min not using fast methods to soil, sediment and sludge, raw food, water, wastewater, atmosphere, biota, fish, aqueous samples, and honey bees [31, 106-114]. Another important information is the analysis of several matrices simultaneously [114-118].

Table 1: GC-ECD methodologies for water researched after 2000

Author	Extraction	GC-ECD	Column	Analysis time	LOD ηg.L^{-1}	LOQ ηg.L^{-1}
López-Blanco et. al. [119]	SDME Endosulfan	A Fisons 8000 series	MDN-5S 30mx0.25mmx0.25µm	32 min.	10	20
Shen et. al. [120]	LMF-DMMLE Endosulfan	Agilent gas chromatograph 7890A series	HP-5 30mx0.32mmx0.25µm	37 min.	3.2 - 4.1	-
Behfar et. al. [121]	Glass column packed with Florisil and Na_2SO_4 Endosulfan	Agilent 6890N (HP) gas chromatograph	DB-5 30mx0.25mmx0.25µm	29 min.	8 – 8.8.	-
Karadeniz & Yenisoy-Karakas [122]	SPE Endosulfan	Hewlett Packard (HP) 6890 N series gas chromatography	HP-5MS 30mx0.25mmx0.25µm	32.8 min	0.06 – 0.3	0.2 - 1
Carmo et. al. [109]	SPME 6 organochlorine pesticides	A Shimadzu GC-14B gas chromatograph	HP-5 30mx0.32mmx0.25µm	43 min.	0.44 - 0.64	1.65 - 2.12

It is possible to observe in Table 1 the change in the applied extraction techniques. There is also an improvement in detection limits over the years with more efficient extractions as well as more sensitive detectors. The use of non-polar columns such as 5 % phenyl 95 % methylpolysiloxane has remained constant.

GAS CHROMATOGRAPH MASS SPECTROMETRY GC-MS

Several investigators have reported the use of mass spectrometry in the study of individual pesticides [123,124] and for the identification of pesticides in mixtures since the 60s [125]. MS detectors have had their application increased since the 1970s for the analysis of chlorinated pesticides in environmental matrices using GC-MS quadrupole.

In 1974, Baughman [126] performed analyses of 2,3,7,8-tetrachlorodibenze-p-dioxin (TCDD) with methodology with detection limit between 0.02 and 0.15 ρg.mL^{-1} with response calibrated with standard solution monitoring the molecular ions of TCDD m/e 320 and 322. As part of a broad study to determine whether 2,3,7,8-tetrachlorodibenzo-E-dioxin (TCDD) is accumulating in the environment due to approved uses of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) based herbicides, Shadoff et. al. [127] collected samples of fish, water, mud and human milk from areas in Arkansas and Texas where 2,4,5-T herbicides are used and were analyzed for TCDD. TCDD was not detected by a GC-MS in any sample, with an average detection limit less than 0.01 ρg.mL^{-1}.

PCBs and chlorinated naphthalenes have been separated by silicic acid column chromatography prior to analysis by gas chromatography. However, the use of a gas chromatograph - mass spectrometer enables the qualitative and quantitative analysis of these compounds without prior column chromatography or complete separation on a gas chromatographic column [128]. GC-MS techniques have been a major instrumental advance in identifying traces of xenobiotic chemicals in

biological tissues, but work has been needed to improve the sensitivity of instrumentation and enrichment of the trace chemicals [129]. Most applications in this decade were directed to qualitative analysis.

In the 1980s, quantification of organochlorine pesticides was performed with an electron capture positive and negative detector and other detectors, while MS was used in qualitative confirmation methods [130-134]. The signal acquisition rate of the first mass spectrometers was very low, but with very high detection limits. This limited the application of MS for quantification.

However, researchers like Hargesheimer [135], used selected ion monitoring mass spectrometry (SIM) by chemical methane ionization (CI) to identify and conclusively distinguish 19 organochlorine pesticides from polychlorinated biphenyls (PCBs) in levels of parts per trillion a part per billion in extracts from environmental water samples with minimal sample cleanliness. The detection limit for pesticides and PCBs by CI- SIM screening was 5 and 100 ρg.ml^{-1}, respectively. CI-SIM can be used as an alternative method for the analysis of biological or environmental samples containing interferences that complicate the detection of PCBs and chlorinated pesticides.

In the 90s, this improvement of MS allowed the development of pesticide quantification methods directly with GC-MS. Huskes and Levsen, Aguilar et. al., and Silva et. al. [136-138] identified and quantified pesticides in selected ion monitoring mode using masses and their peak area ratio to characterize a compound, while Benfenati et. al. [139] for example, used the electron impact ionization (EI) mode. Advantages of EI ionization is a low influence of molecular structure on response and a large number of characteristic fragments [140]. Most of the published studies in this decade on residue analysis by GC-MS reported the use of single quadrupole instruments and EI ionization [141-142]. The columns used in the GC follow the same pattern as those used in ECD with small variations in column dimensions and sorbent thickness.

After that decade, researchers have used capillary columns used nonpolar with measures of 30mx0.25mmx0.25um, varying very little for other dimensions and stationary phases. The analysis methods have been improving the analysis time concerning the number of compounds analyzed, however they are greater than 20 min [59, 143-145].

It was also the beginning of two-dimensional gas chromatography applications for pesticides. The theoretical peak capacity of GC×GC has been determined as being an order of magnitude higher than conventional GC methods [146] and has been effectively used for the simultaneous analysis of multiple classes of chemicals in complex environmental matrices: snow samples, soil, sediments, and biota [147-149].

Since 2005, mass spectrometry has been increasingly used in the environmental sciences with the objective of investigating the presence of organic pollutants. A clear trend has been observed, from the very popular GC-MS with a single quadrupole mass analyzer, to tandem mass spectrometry

(MS/MS). The ability of the MS detector to perform tandem mass spectrometry (MS/MS) promotes pesticide analysis at low picogram levels, even in the presence of interference, significantly reducing background noise [71].

More recently, high-resolution mass spectrometry (HRMS) has for years is coupled to HR magnetic sector instruments. The increasing interest in the use of HRMS in the environmental sciences is because of its suitability for both targeted and untargeted analysis, owing to its sensitivity in full-scan acquisition mode and high mass accuracy [150]. In addition, new combinations of mass spectrometers are tested and evaluated bringing improvements in the area of analysis as the hybrid quadrupole time of flight mass spectrometry (QqTOF-MS), effectively employed in the detection of photo-degraded or the hydrolyzed products of pesticides found in environmental waters [151] and orbitrap mass spectrometer recently development used as single-stage mass spectrometer in the form of orbitrap technology for the analysis of pesticides to ensure food safety [152].

Since 2010, in the articles studied, not many changes have been observed besides columns and increasingly sophisticated materials that make chromatography faster, and easier to handle, with greater conservation of components, savings in consumption, and better analytical detection. There is also an improvement in sensitivity combined with modern extraction techniques, reaching lower LOD values. On the other hand, Peterson et.al. [153] details the development and characterization of a GC-QLT-Orbitrap hybrid mass spectrometer with high resolution (up to 100,000 at m/z 400) and subpart mass accuracy per million GC-MS. A high-service cycle, innovative scanning type, nested scanning, was implemented to synchronize the Orbitrap acquisition rate and the gas chromatography time scale (up to 6.5 Hz at 7500 resolution), but it is not applied to pesticides analysis yet.

GAS CHROMATOGRAPHY TANDEM MASS SPECTROMETRY GC-MS/MS

Tandem mass spectrometry (MS-MS) has gained rapid acceptance in the analytical community since its introduction in the 1970s [154]. Its acceptance has been due largely to its ability to provide sensitive and selective analysis of complex mixtures rapidly, often with minimal, if any, sample cleanup [155-158]. Due to the acceptance of MS/MS, research involving pesticides was carried out in 1986, Hummel & Yost [159] analyzed organophosphate and carbamate levels with LOD between 0.1 and 20 $\eta g.\mu l^{-1}$ on to the 50 cm packed GC column and Simon et. al. [160] for quantification of tetrachlorodibenzo-p-dioxin in soils and sediments com detection limits above 1 $\eta g.g^{-1}$ and 5% RSD.

McLafferty [161] concluded MS-MS does appear to offer a promising potential for obtaining analytical information from complex organic mixtures which are difficult to analyze by GC-MS. Trace quantitative analysis for specific compounds in complex mixtures, analogous to selected ion monitoring in GC-MS, is feasible. The utility of the technique lies in combining the specificity and

sensitivity of MS/MS with retention time data and an increased time scale, which allows multiple experiments to be performed. Bonner [162] demonstrates direct mixture analysis is feasible in some cases, GC-MS/MS is extremely useful since retention time (isomer) information is retained and "multi-experiments". Most recently, Dai et. al. and Lozowicka et al. [163, 164] considered a limitation of this technique is the susceptibility to the matrix effects, which negatively affect quantification and qualification, mainly in the analysis of complex samples, even though, they considered GC-MS/MS as the most efficient strategy for the determination of pesticide residues in different matrices. There are a growing number of protocols relying on the application of these new techniques GC-MS/MS to improve the analysis of POPs in environmental matrices and to determine new emerging contaminant classes [165,166].

GC-ITMS allows the ion trap to isolate an ion of interest and then produce characteristic collision-induced dissociation (ICD) descending ions and can unambiguously distinguish the compound of interest from other compounds that have parent ions with the same mass / charge ratio. The ability to intercept an ion of interest for some time and then remove matrix ions makes it possible to analyze directly for specific compounds in complex matrices [167].

This decade produced several researches on the use of tandem GC in the quantification of pesticides. Analysis in water [168,169] fruits and vegetables [170], soil [171], and even endosulfan in human urine [172] were produced using ion-trap, quadrupole, and hybrid mass spectrometer.

Johnson et. al. [173], compared on Quadrupole Ion Trap (ITMS) and Triple Quadrupole. ITMS and TQMS produced child ions of similar abundances, with ITMS being more efficient in fragmentation, collection, mass selection, and transmission of child ions to the detector. The detection limits were set at approximately 5 ρg for both detectors. One of the most important advantages of the ion trap is the high efficiency with which MS/MS can be implemented. Comparison of MS/MS on the ITMS to MS/MS on the more conventional TQMS demonstrated that the ITMS has higher CID efficiencies (80-90%) with an overall MS/MS efficiency approximately 14 times higher than that of the TQMS. In addition, the quantitative studies showed that the ITMS was able to obtain complete daughter spectra on low picogram amounts of analyte, 100 times lower than the amounts required for comparable spectra on the triple quadrupole.

Other comparisons were made. Frenich et. al. [174] also compared the ITMS and TQMS detectors concluding that ITMS is the best option since the number of analytes and the instrumental analysis time is not a key factor in laboratory performance. The MS data obtained by each analyzer were very similar within the group of compounds studied, including endosulfan, although more spectral information (ion spectrum of the complete product) was provided by the IT analyzer.

The triple quadrupole instruments excel in the area of quantification and targeted compound analysis. The single reaction monitoring and MRM modes of operation of triple quadrupoles provide

high-duty cycles, maximizing sampling efficiency [175]. Belarbi et. al. [176] performed multi-residue analyses of one hundred pesticides and contaminants comparing Triple Quadrupole and Q-Orbitrap. Results involving endosulfan sulfate show better quantification results for Q-Orbitrap with 0.1µg/kg despite the small difference.

Hybrid instruments such as tandem mass spectrometers that incorporate sector-type analyzers (magnetic and/or electrostatic analyzers) and quadrupoles have fallen out of use while the ion-trap and quadrupole models have become more popular [176]. Therefore, the use of a new hybrid quadrupole / linear ion trap, known as Q TRAP, offers unique benefits as an MS-MS detector for small and large molecule analysis. Combined methods such as atmospheric pressure gas chromatography quadrupole-time-of-flight mass spectrometry (APGC-QTOF-MS) shorten the analysis time compared to traditional GC–MS/MS and therefore have a great advantage for the rapid screening of organic contaminants. The screening detection limits (SDL) for this method were determined for endosulfan I (not determined), II (10 µg kg^{-1}) and endosulfan sulfate (50 µg kg^{-1}) [177].

The numerous methods available for pesticide analysis show the importance of this application and the fast pace of development in analytical chemistry. For endosulfan, the tandem GC method has achieved increasingly lower LODs in recent years using Triple Quadrupole and Q-Orbitrap detectors as shown in Tables 2 to 5.

Table 2:Methodologies for GC-MS with water until 2000.

Author	**Extraction**	**GC-MS**	**Column**	**Analysis time**	**LOD ηg.L^{-1}**	**Mass Ranger**
Pablo-Espadas et. al. [169]	SPE 14 pesticides (Endosulfan)	Saturn 2000 Ion trap MS GC-MS	DB-5 MS 30mx0.25mmx0.25µm	40 min.	2.4 – 81.5	85 – 450 m/z
Natangelo et. al. [168]	SPME 4 chloroacetanilides	GC HP 5890 – MS HP 5871 Quadrupole	PTA-5 30mx0.25mmx0.50µm	14 min	2 -30	88 – 179 m/z
Howard et. al. [178]	SPE 5 organochlorines (Endosulfan)	GC HP 5890 – MS HP 5972 Quadrupole	DB 1701 15mx0.25mmx0.25µm	16 min.	200 – 1000	165 – 354 m/z
Huskes and Levsen [136]	SPE 10 compounds Triazine and other.	GC (5890) – Magnetic sector MS VG 70-SQ GC-MS	DB-5625 Not Dimension	24 min.	3 - 30	40 - 440 m/z
Patsias & Papadopoulou-Mourkidou [179]	SPE 96 compounds (Endosulfan)	Varian 3300 Tracker/Magnum ion trap MS	DB-5 MS 30mx0.25mmx0.25µm	54 min	10 - 50	50 – 450 m/z

NI - Not informed

Table 3: Methodologies for GC-MS with water after 2000.

Author	Extraction	GC-MS	Column	Analysis time	LOD ηg.L^{-1}	Mass Ranger
Valenzuela et al. [180]	LPME 29 pesticides (Endosulfan)	GC (7890) – MS Quad (5975)	DB 5MS 30mx0.25mmx0.25µm	25 min	17 – 784	45 - 500 m/z
Climent et. al. [181]	SPE 16 pesticides	GC (7890) – MS Triple Axi (5975C)	ZB 5MS 30mx0.25mmx0.25µm	24 min	11 – 30	N.I.
Bulgurcuoglu et. al. [182]	DLLME 16 Compounds	GC (6890) – MS Quad	HP 5MS 30mx0.25mmx0.25µm	7 min	300 - 3000	35 – 700 m/z
Bonansea et. al. [183]	SPE 8 pesticides (Endosulfan)	GC Varian 2200 MS ion trap	VF - 5 30mx0.25mmx0.25µm	25 min.	0.07 – 3.5	100 – 500 m/z
Hladik et. al. [184]	SPE 60 pesticides	GC Varian Saturn 2000 – MS Ion trap.	DB 5MS 30mx0.25mmx0.25µm	61 min	1 – 12	N.I.

NI - Not informed

Table 4: Methodologies for GC-MS/MS with water until 2000.

Author	Extraction	GC-MS/MS	Column	Analysis time	LOD ηg.L^{-1}	Mass Ranger
Pablo-Espadas et. al. [169]	SPE 14 Organochlorines (Endosulfan)	Saturn 2000 MS Ion trap GC-MS/MS	DB-5 MS 30mx0.25mmx0.25µm	40 min	0.4 – 22.5	85/450 m/z
Natangelo et. al. [168]	SPME 4 chloroacetanilides	Varian 3800 GC Ion trap MS/MS GC-MS/MS	HP-5 MS 30mx0.25mmx0.25µm	26 min.	2 - 15	88 – 223 m/z
Verma et. al. [185]	SPE 11 pesticides	GC (Varian) - MS/MS (Varian Saturn III ion trap) GC-MS/MS	HP-5 MS 30mx0.25mmx0.25µm	20 min	0.3 - 2	50 – 400 m/z
Steen et. al. [186]	SPE Irgarol 1051	GC (Varian) - MS/MS (Varian Saturn III ion trap) GC-MS/MS	DB-5 MS-ITD 30mx0.25mmx0.25µm	41 min	0.1	50 - 450 m/z
Steen et. al. [187]	SPE 5 pesticides	GC (Varian) - MS/MS (Varian Saturn III ion trap) GC-MS/MS	BPX-5 25mx0.22mmx0.25µm	49 min.	0.20 - 0.50	N.I.

NI - Not informed

Table 5: Methodologies for GC-MS/MS with water after 2000.

Author	Extraction	GC-MS/MS	Column	Analysis time	LOD ηg.L^{-1}	Mass Ranger
Canli et. al. [188]	SBSE 117 endocrine disruptors (Endosulfan)	GC (7890B) – MS/MS (7000D) Triple quad	HP-5ms 30mx0.25mmx0.25µm	21 min.	0.04 - 15	N.I.
Cárdenas-Soracá et. al. [189]	UASE SPME 18 Organochlorines (Endosulfan)	GC (7890A) – MS/MS (7000) Triple quad	HP-5ms 30mx0.25mmx0.25µm	36 min.	0.01 - 0.27	101 – 263 m/z
He & Aga [190]	SPE 52 Compounds (Endosulfan)	GC (Thermo Trace) – TSQ Quantum MS GC-MS/MS	DB-5HT 30mx0.25mmx0.25µm	29 min	0.8 - 9	128 – 362 m/z
Wang et. al. [191]	SPE 6 Organochlorines	GC (7890A) – MS/MS (7000B) Triple quad	HP-5ms 30mx0.25mmx0.25µm	17 min.	0.04 - 0.35	50 - 400 m/z
Derouiche et. al. [192]	SPME 15 Organochlorines	Saturn 3 Ion Trap	DB-5MS 30mx0.25mmx0.25µm	70 min	0.4 - 26	50 – 650 m/z

NI - Not informed

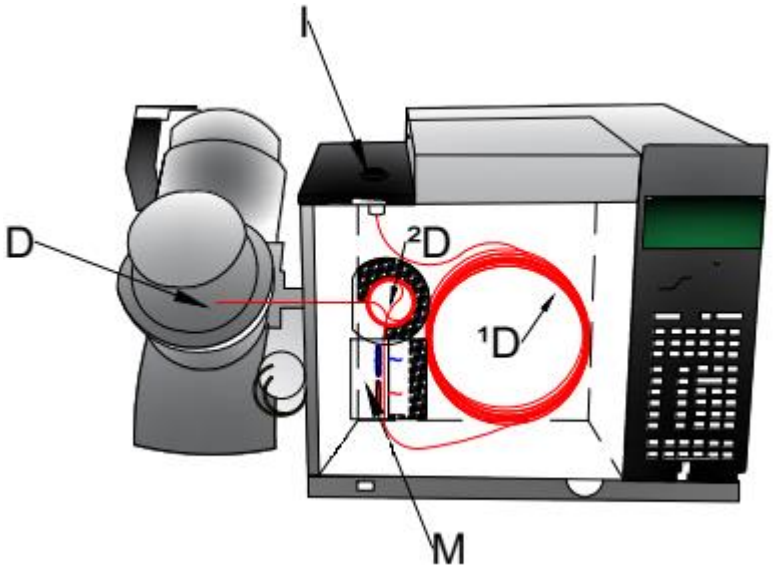
According to the tables, the LOD observed in GC-MS and GC-MS/MS differs between the authors. It is interesting to note that the LOD for GC-MS is on average higher than the MS/MS, but comparable to GC-ECD, presented on table 1.

In the 20th century, research has found more use of quadrupole-type mass spectrometers for GC-MS and ion traps for tandem mass spectrometers. Natangelo et. al. [168] and Pablo-Espadas et. al. [169] compared the two mass spectrometers obtaining superior analytical response in MS/MS. For GC-MS, the ion trap mass spectrometer is not commonly used to analyze pesticides in water, but it obtained low detection limits as much as the quadrupole type in the 21st century.

TWO-DIMENSIONAL GAS CHROMATOGRAPHY TIME-OF-FLIGHT MASS SPECTROMETRY GC×GC/TOFMS

Comprehensive two-dimensional gas chromatography (GC×GC) is a technique characterized by the sequential combination of two columns, typically one of the conventional dimensions, and another one shorter (capable of generating fast-GC analysis), such that all samples pass through a modulator. In the most widely employed modulator system (based on cryogenic methods), modulation between the two columns provides compression of the chromatographic band eluting from the first column and fast introduction of the compressed band into the second column. This second step must be considered in light of the need to achieve a very fast separation in the second column. The modulator performs the function of collecting (focussing) the solute at the end of 1D and rapidly introducing it to the 2D column (figure 5). The detector therefore only records these very fast, narrow, modulated peaks [79,193, 194].

Fig. 5 - Schematic diagram of the GC×GC instrument, showing use of a short, fast elution second dimension column which produces very narrow peaks at the detector. I, injector; M, modulator; D, detector. 1D = first dimension column, 2D = second dimension column.



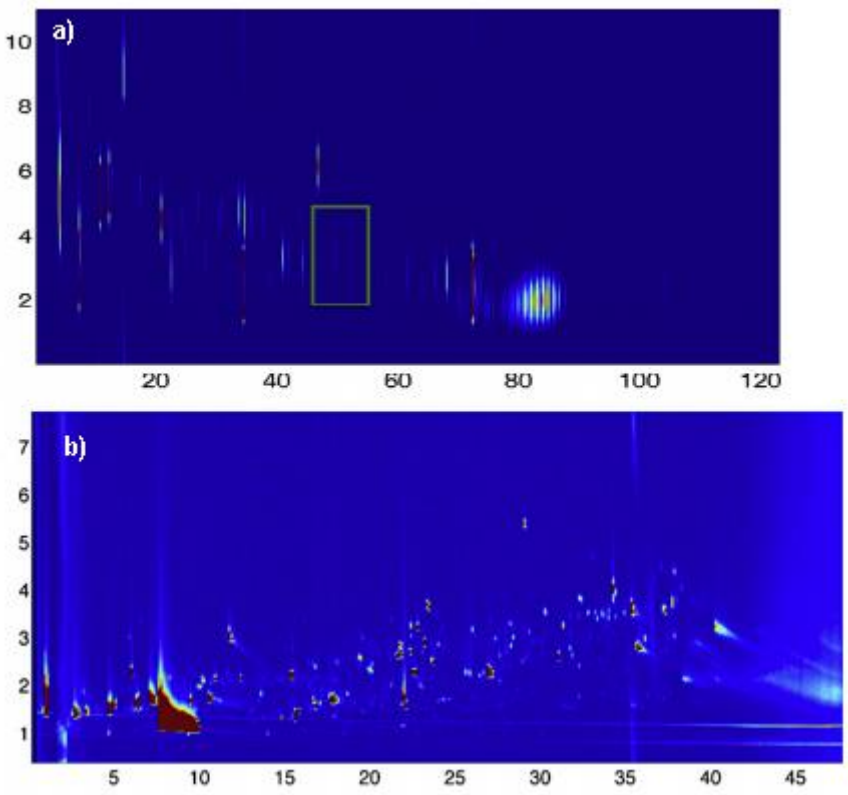
Comprehensive two-dimensional gas chromatography (GC×GC) has gained wide implementation in the analysis of complex environmental samples since pioneered nearly 30 years ago [195]. Many authors, such as Winnike et. al. [196] noted that even though the most abundant metabolites in the samples were detected on both the GC-MS and GC×GC-MS platforms, the GC×GC-MS platform detected a considerable number of chromatographic peaks that were not detected in GC-MS, resulting in the identification of a higher number of metabolites.

As the chromatographic peaks generated in the GC×GC system are narrower than the ones generated in a conventional GC, quadrupole mass spectrometers are limited in providing a sufficient data acquisition rate to obtain a Gaussian narrow peak, especially for trace analysis. The most consolidated detector at this moment for GC×GC trace analysis is the TOFMS, while ECD was also applied for organochlorine compounds, including endosulfan. Muscalu et. al. [197] developed an accredited routine method for the analysis of polychlorinated biphenyls, organochlorine pesticides, chlorobenzenes, and screening of other halogenated organics in soil, sediment, and sludge by GCxGC-μECD. This method became part of the Canada Protocol for Analytical Methods. Khummueng et. al. [100] use dual detection (NPD/ECD) in comprehensive two-dimensional gas chromatography for the multiclass analysis of pesticides from the same family.

Samanipour et. al. [198] performed an analyte quantification evaluating methods for baseline correction, peak design, and matrix effect elimination for real samples containing organochlorine pesticides. The chlorinated hydrocarbon standards and the lake water extract were analyzed by a GC×GC coupled to an electron capture and negative chemical ionization (ENCI) time of flight mass spectrometry. The separation was carried out on a 30 m length, 0.25 mm inner diameter (i.d.), 0.25

µm film thickness RXI-1MS column as the first dimension, and a 1 m length, 0.1 mm i.d., 0.1 µm film thickness BPX-50 as column as the second dimension (figure 6).

Fig. 6 - Trace level chlorinated hydrocarbon target analytes in the lake water extract. a) GCxGC-µECD. b) GC×GC/TOFMS



Source: Samanipour et. al. [198].

The first commercially successful time-of-flight mass spectrometer was based on a design reported by Wiley and McLaren [199]. Improvements have been made in mass resolution and high-speed data acquisition systems have been developed which enable the recording of all ions in each time-of-flight cycle [200]. The main limitation for the application of TOFMS at that time was the computational speed needed for the data acquisition. Nowadays, some equipment can register as much as 500 full mass spectra/min acquisition rate. This acquisition speed is not always used, especially due to the memory needed to save the big data generated [201]. However the literature presents the benefits of using acquisition rates such as 200 spectra/min to achieve a better deconvolution of mass spectra in complex samples.

Studies involving pesticide determination in environmental matrices using GC×GC/TOFMS have grown since 2002, revealing the potentiality of the technique. For a pesticide analysis, interferences with the same mass, but different molecular formulas, are commonly present, especially in complex matrices. In cases where multiple isomers of a pesticide are present in the sample, the resolution of the mass spectrometry unit often fails to differentiate these compounds. So, mass analyzers with higher resolution power and chromatographic resolution are needed in these

applications [202]. In the other hand, a high-resolution time-of-flight mass spectrometer has been demonstrated as a powerful tool for reliable detection and accurate quantification of pesticide residues even at very low concentration levels. The performance characteristics obtained in many respects exceed those achievable by conventional MS analyzers [203].

Schurek et. al. [204] in their study, compares the extracts of solid phase micro extraction (SPME) analyzed using conventional GC HP 6890 and GC×GC, both coupled to a high-speed TOFMS Pegasus III detector with BPX-5 column and SupelcoWax (table 8).

Table 8: Detectability comparison for α endosulfan and other organochlorines in GC/TOFMS and GC×GC/TOFMS system under optimal conditions

Pesticides	Quantification (bold) and identification ions	Enhancement factor	MS match factor (Similarity/reverse)	
			GC	GC×GC
Alpha BHC	181,217,219	9.4	807/886	935/940
Beta BHC	109, 183, 219	6.9	735/875	758/889
Gamma BHC	181, 183, 219	10.2	798/874	851/898
Heptachlor	237, 272, 372	1.2	-	913/801
Alpha endosulfan	195, 241, 339	2.4	768/860	885/890
Dieldrin	79, 149, 263	7	-	927/942
DDD	165, 199, 212	3.5	-	892/897
DDE	316, 318, 246	7.1	-	897/915
DDT	165, 235, 237	4	859/870	867/908
Aldrin	109, 263, 265	15.2	876/864	905/906
Endrin	263, 261, 317	8	872/895	901/915

Source: Schurek et. al. [204]. Adapted.

When employing one-dimensional GC/TOFMS, confirmation based on the mass spectrum "MS correspondence" factors with the NIST library could not be achieved (the value of this parameter greater than 600 was defined as a minimum requirement) for 9 of 36 pesticides (peak at 50g.kg^{-1} level) due to many coelutions. The quantification limits (LOQs) were higher than the maximum residue limits (MRLs) of the European Union. A significant improvement in the quality of the mass spectra and a distinct increase in the S/N ratios (decrease in LOQs) was achieved by the application of the GC×GC separation being demonstrated through the improvement factor. The improvement factor is defined as the ratio between S/N of the pesticide peak in GC×GC and GC. In addition, GC×GC had all analytes identified and 79% of the “MS compatibility” factors were above 850 [204,205]. The comparison of detection capabilities in GC /TOFMS and GC×GC/TOFMS can be seen in Table 8.

In the determination of multiple pesticide residues, the GC×GC/TOFMS proved to be a powerful tool to solve problems with the reliable verification of pesticide residues at very low concentration levels, applicable for the analysis of endosulfan alpha, beta and endosulfan sulfate [206]. Hoh et al. [207] described a non-target analytical method using the direct introduction of samples coupled with GC×GC/TOFMS, which could characterize a wide spectrum of non-polar contaminants

(for example, PCBs, PBDEs, and PBBs) in the fat of the common Atlantic dolphin for example. Misselwitz et. al. [208], provided a good separation of the complex matrix (tobacco) of the pesticides of interest with the GC×GC/TOFMS, using a QuEChERS extraction. Analyzes of pesticides in water are reported in Table 9.

Table 9: Analysis of pesticide trace in water by GC×GC/TOFMS

Author	Extraction	Chromatography	Column	Analysis time	LOD ηg.L^{-1}	LOQ ηg.L^{-1}
Wooding et. al. [18]	Stir bars (SBSE) 61 compounds	GC×GC 7890A GC×GC-TOFMS	1D – RTX-CLPesticides II 30mx0.25mmx0.2µm 2D - Rxi-17Sil MS 1.1mx0.25x0.25 µm	34.5 min.	0.001 - 0.19	0.003 - 0.63
Gómez et. al. [209]	SBSE 27 pesticides (endosulfan)	GC×GC 7890A GC×GC-TOFMS	1D – Rtx-5 10mx0.18mmx0.20µm 2D – Rtx-17 1mx0.1mmx0.1 µm	19 – 26 min.	-	0.05 – 2.3
Gómez et. al. [210]	SBSE 54 compounds (endosulfan)	GC×GC 7890A GC×GC-TOFMS	1D – DB-5 10mx0.18mmx0.20µm 2D – BPX-50 1mx0.1mmx0.1 µm	19 – 26 min.	0.17 - 1.96	0.56 - 6.53
Ochiai et. al. [211]	SBSE 23 organochlorines	GC×GC-TOFMS	1D - DB-5 10mx0.18mmx0.18µm 2D - TRB-50HT 2mx0.1mmx0.1µm	25 min.	0.012 – 0.044	N.I.
Matamoros et. al. [212]	SPE 97 coumpounds 12 organochlorines	HP 6890N GC×GC-TOFMS	1D - TRB-5ms 30mx0.25mmx0.25µm 2D - TRB-50HT 2mx0.1mmx0.1µm	48 - 53 min.	2 - 6	3 - 15

It is observed that the detection limits for analyzing traces of pesticides in water are very low. The analytical response of comprehensive two-dimensional gas chromatography with time-of-flight mass spectrometry reaches limits as low as routine analysis equipment such as GC-MS/MS. However, little research on the water matrix of pesticides such as endosulfan has been developed in recent years.

CONCLUSION

The evolution of analytical methods concerning the analysis of endosulfan and its metabolites in environmental samples was evaluated in the context of multiresidue pesticide analysis, together with the history of chromatography and mass spectrometry.

It was not possible to observe a single analytical solution in terms of sample preparation and analytical instrumentation. Methodologies vary in seeking excellent results with different columns, detectors, and extraction methods. Extraction methods have evolved a lot and have become more efficient, easier, faster, and more economical. Techniques such as SBSE and SPME have become

promising in the analysis of endosulfan in water and the SPME method as well as SPE are widely used mainly with one-dimensional chromatographs.

Concerns about the matrix effect are also important for the choice of method. For complex matrices, the application of GC×GC/TOFMS showed improvements to solve co-eluted compounds. Cheaper and less complex chromatographs for routine analysis and detectors with greater sensitivity to achieve lower and lower LODs become more important. Comprehensive two-dimensional chromatography with time-of-flight mass spectrometry is capable of scanning divergent polarities and is best suited for analyzing all endosulfan metabolites, including endosulfan diol. Concerns about the matrix effect are also important for the choice of method. For complex matrices, the application of GC×GC/TOFMS showed improvements to solve co-eluted compounds.

The most used columns for endosulfan analysis are low polarity for the first dimension for any GC and medium polarity for the second dimension for GC×GC. For the analysis of new endosulfan analytes, two-dimensional chromatography is sought due to divergent polarities, as in the case of endosulfan alcohol.

When it comes to the best LOD results, Gas Chromatography Tandem Mass Spectrometry has shown good results with ranges from 10 to 270 pg L^{-1}.

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Population dynamics of *Phyllocnistis citrella* Stainton, 1856 (Lepidoptera, Gracillariidae) and impact of its parasitism on clementine trees at the Boufarik-Blida station (Algeria)

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Bendoumia Houda[1], Lorabi Ibtissam[2], Oudjouadj Nour El Houda[3], Khechna Hassina[4] and Doumandji Salaheddine[5]

ABSTRACT

A study was conducted for eight months in 2021 in the Boufarik-Blida region (Algeria) to analyse the population dynamics of *Phyllocnistis citrella* and the incidence of the parasite on citrus fruit, inparticular clementines. The main data showed a significant increase in the rate of parasitism, with peaks of 73% and 72% during the first outing. After 28 June, fluctuations in the rate of parasitism were observed, highlighting the importance of the activity of beneficials, particularly those reared in a greenhouse close to the orchards, such as *Semielacher pesiolatus*. The relationship between rates of infestation and parasitism is increasing, with parasitism exceeding infestation. This dynamicis influenced by several factors, including temperature variations, and highlights the effectiveness of biological control using parasitoids. The installation of greenhouses for rearing beneficials near infested orchards, combined with other integrated pest management methods, represents a promising and sustainable solution for combating citrus leafminer.

Keywords: *Phyllocnistis citrella*, Clementine, Parasitoids, Integrated pest management, Boufarik-Algeria.

[1] Doctor of Agricultural Sciences, Department of Natural Sciences and Life University Yahia Fares of Medea
Médéa, Argélia
E-mail: bendoumiahouda@gmail.com
[2] Master of Sciences in Agronomy, Department of Natural Sciences and Life University Yahia Fares of Medea
Médéa, Argélia
E-mail: ibtissamlorabi@gmail.com
[3] Master of Sciences in Agronomy, Department of Natural Sciences and Life University Yahia Fares of Medea
Médéa, Argélia
E-mail: houdacool1@gmail.com
[4] Doctor of Agricultural Sciences, National Institute for Plant Protection Blida. Algeria
E-mail: khechnahassina@gmail.com
[5] Professor of Agricultural Sciences, Department of Agricultural and Forest Zooloy Agronomic National School Superior of El Harrach
El Harrach. Algeria
E-mail: s.doumandji@ensa.dz

INTRODUCTION

Among the countries of the Mediterranean basin, Algeria is a major citrus producer and exporter (Loussert, 1989; Khechna, 2011; Khechna *and al*., 2017; Mahmoudi *and al*., 2017; Bendoumia *and al*., 2023). In fact, Algerian citrus growing is particularly widespread in the Mitidja plain, where it represents a strategic segment (Khechna, 2018). However, according to Khechna, citrus growing is subject to pressure from a multitude of bio-aggressors, including fungi, bacteria, viruses, nematodes and insects, which can either cause severe yield losses or alter the quality of produce or plants, resulting in downgrading or even failure to market.

One of these pests is *Phyllocnistis citrella* (Stainton, 1856), which appeared in Algeria inthe summer of 1994 (Berkani, 1995; Berkani, 2003 and Berkani *and al*., 1996). This insect is considered to be a major enemy of citrus plantations because of its great climatic adaptability and the damage it causes, since it affects the photosynthetic function, resulting in a drop in yield in oldertrees and slower growth in young plants (Saharaoui, 1997; Smith *and al*., 1997; Saharaoui *and al*., 2001; Khechna *and al*., 2017; Khfif, 2022).

The excessive and inappropriate use of conventional pesticides (broad spectrum of action, low selectivity) against harmful organisms has disrupted the natural balance of the agricultural ecosystem (effect on parasitoids and predators, infestations of secondary pests, phenomenon of pestresistance). In addition, they present serious health risks for farmers and negative repercussions forthe environment (contaminating the air, soil and groundwater) (Soltani, 2013). In fact, the use of biological control with other control techniques can be a solution for integrated protection against pests (Argov and Rossler, (1998); Schauff *and al*. (1998) ; Khfif 2022 ; Fazekas (2023) ; Ullah *andal*. (2023)). According to these authors, biological control plays a vital role in reducing the population of this leafminer and its success depends on continuous monitoring of orchards and of the populations actually present in order to intervene at the right time.

In the light of the preceding bibliographical data, the problem of the present study is constructed. The aim of this study is to investigate the bio-ecology of the citrus leafminer *Phyllocnistis citrella* and to identify the beneficials that can play an important role in the biological control of the clementine varietie in the Boufarik-Blida region (Algeria), which is very rich in citrus fruits, during the national containment period as a preventive measure against the Corona virus ‘Covid-19’ pandemic. These studies should lead to the limitation of losses in terms of quantity and quality and propose effective and non-polluting control techniques (Bendoumia, 2018).

MATERIALS AND METHODS

The present study was carried out at the Boufarik station (36° 59′ 49″ 42 N., 2° 91′ 98″ 26.7L.) on the Mitidja plain in Algeria. It covers an area of 3 ha and is bordered to the north, west and south

by citrus orchards and to the east by the motorway. The station is located at the entrance to the town of Boufarik in the semi-urban zone, on the edge of the road leading to Tessala El Merdja.Its work is technical and administrative, and it is affiliated to the I.N.P.V. in El Harrach.

A clementine orchard (*Citrus clementina*) was chosen to carry out the required observations.It should be noted that this clementine orchard is located next to a greenhouse where parasitoids ofthe *Citrus leafminer*, *Semielacher pesiolatus* in particular, are reared. In addition, the health of the trees in this orchard is clean : no pesticides are used in the orchard.

Sampling was carried out several times a month for 08 successive months in 2021 (Januaryto August). It should be noted that this is a very difficult period with national containment as a preventive measure against the 'Covid-19' corona virus pandemic. In addition, periodic and random population counts were carried out in order to monitor variations in the infestation rate and the parasitism rate of the pest *Phyllocnistis citrella*. Samples were taken at ground level from two treesin each of these blocks, at different cardinal points of the tree, on branches containing young, medium-sized or old shoots. The samples, made up of 100 leaves for each sampling, were placed inpaper bags with all the information needed to identify the sample, in particular the date taken, the location, the variety and the orientation of the branches on the tree.

In the laboratory, the various stages of the leafminer - living, dead or parasitized - were identified under a binocular microscope and recorded for each leaf surface. In addition, the nymphsof the various species of beneficial insects were collected. It should be noted that the stages of development of the insects were precisely identified on the basis of scientific criteria reported in the literature, in particular the criteria mentioned by (Berkani, 2003).

RESULTS AND DISCUSSION

The rate of infestation and parasitism and the effect of parasitoid use obtained during the period January-August 2021 are developed.

FLUCTUATION OF THE *PHYLLOCNISTIS CITRELLA* POPULATION

Table 1 and Figure 1 show the fluctuation in the *Phyllocnistis citrella* population over the period June-August 2021.

Fig. 1 - Total results for variations in the various stages of parasitism Source : Prepared by the authors (2024)

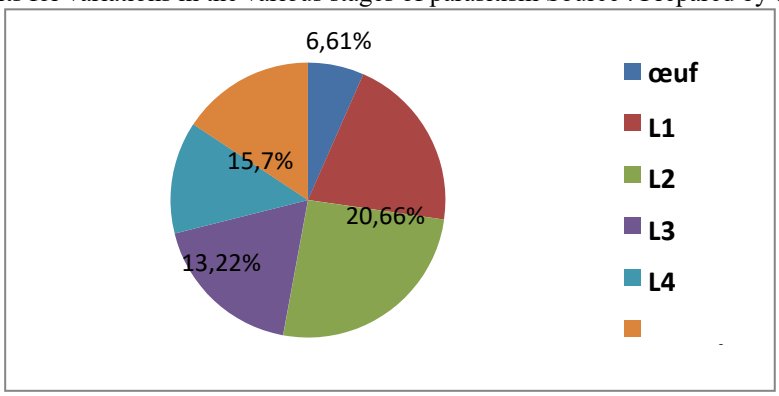


Table 1 - Different stages of parasitism during the study period Source : Prepared by the authors (2024)

The dates	Stadiums and numbers						
	egg	L1	L2	L3	L4	Nymphe	Total
January - May	0	0	0	0	0	0	**0**
07-06-2021	0	0	0	0	0	0	**0**
14-06-2021	0	0	2	4	2	8	**16**
21-06-2021	3	1	6	1	6	1	**18**
28-06-2021	1	3	2	5	1	1	**13**
04-07-2021	2	10	2	1	3	3	**21**
12-07-2021	2	2	13	4	1	2	**24**
19-07-2021	0	5	4	5	2	4	**20**
09-08-2021	1	4	2	2	1	0	**18**
The Total	**08**	**25**	**31**	**22**	**16**	**19**	**122**

Analysis of the results of fluctuations in the population of *Phyllocnistis citrella*

Table (1) shows a fluctuation in the number of *Phyllocnistis citrella* populations on clementines in the Boufarik region during the period (January-August 2021).

The total number of eggs laid during this period was very low, fluctuating between 8 and 122 individuals.

The delay in the establishment of *Phyllocnistis citrella* was due to thermal conditions duringthe month of January and the first week of June when the temperature was below 18°C and there was a lack of food. After this period there was an increase in vegetation under favourable climatic conditions.

In July 2021, *Phyllocnistis citrella* reached the peak of its development under climatic conditions of (T=24.7 to 28.9° and humidity of 45%).

The number of larvae considered to be the greatest in relation to the other 94 stages was 122. We reported a number of 25 individuals of L1, 31 individuals of L2, 22 individuals of L3, 16 individuals of L4. For the number of nymphs is presented with a very important number 19 to 122 individuals. It should be pointed out that for the first few months of the study, *Phyllocnistis citrella* had zero activity or no activity at all.

The results of this study show that the leafminer is subject to various mortality factors. Among the factors influencing its development, climatic conditions are essential ecological

parameters in the development of any living being. Another factor affecting parasitism is competition between species. A very important factor is the acclimatisation of parasitoids.

Discussion on population fluctuations of *Phyllocnistis citrella*

In citrus fruit, sap flow corresponds to the emission of tender young leaves, the duration of which depends on climatic conditions, the nature of the orchard (age, maintenance, etc.) and the

species. The tree emits three sap bursts a year : the first in spring (PS1), the second in summer (PS2)and the third in autumn (PS3). The first leaves of PS1 generally appear at the end of February, andfinish in mid-June. A week to ten days later, the first leaves of the second, very short-lived sap burstappear, followed by the third and final sap burst (PS3). Flowering occurs during SP1. However, thephrenological development of citrus trees is more or less complex depending on other parameters such as the site and the health of the tree (Boualem, 2009).

Berkani (1995), shows that in summer the pest *Phyllocnistis citrella* is very active and attacks sap-laying seconds. Attacks by *Phyllocnistis citrella* on lemons are higher than on oranges and clementines ; during the months of December, January and February, attacks are low on all three hosts. This is due to the slower vegetative stage, which lengthens the cycle.

Zouaoui (1997), points out that the availability of abundant and fresh vegetation added to favourable climatic conditions from the end of May until the end of June under conditions of (average T = 18.06 to 21.15°C and humidity from 65.55 to 69.18%) the leafminer reaches a maximum development following to the availability of food (the summer posse) and prolongation of favourable climatic conditions one even sees a fast succession during the second dekad of July until the end of September. From the third dekad of July to the first dekad of August, the maximum temperature frequently exceeding 30° with a slightly low humidity of 57% affects the developmentof the pest and the population density decreases.

Zouaoui (1997), shows that during the third dekad of July and the whole month of August and under conditions of (T is higher than 30° and minimum humidity of 50%) negatively affect the development of *Phyllocnistis citrella*.

Saharaoui *and al.* (2001), after three successive years of observations in 1996, 1997 and 1998, show that heavy outbreaks of the leafminer were observed on both citrus varieties. In winterand in the plain of Mitidja the minimum and maximum temperatures vary between 4 and 10°C and14 and 20°C, the relative humidity of the air oscillates between 68% and 87.9% and the pluviometryof 6.7mm in this period the leafminer maintain at a very weak level on some young growth of the lemon trees and on the orange trees one will maintain a complete absence of the leafminer during the first two months of spring. From the second sap flow at the end of June, the insect will recover its development on the young shoots. In summer, when conditions are favourable and humidity high,the

embryonic and larval stages explode and are prolonged during the summer period (end of June-end of August). The availability of abundant fresh vegetation, favoured by very favourable climatic conditions and by irrigated intercropping.

According to Dr. Khechna (2011), the population of *Phyllocnistis citrella* is almost negligible or non-existent during the winter and spring periods. The summer period is the most favourable for leafminer populations due to favourable temperatures and the presence of tender young leaves.

Mechelany and Matny (1998) show that *Phyllocnistis citrella* attacks on lemons are higher than on oranges and clementines. Attack is very low on the three hosts, which is due to the slow vegetative stage of the insect in diapause, which means that the cycle is longer, and to the climatic conditions.

According to Boualeme (2009), many countries infested by the citrus leafminer have optedin particular for the introduction and acclimatisation of entomophagous species. Populations of the leafminer are more or less regulated by the action of the various mortality factors present, which makes it possible to control the pest. mortality factors, which helps to mitigate its harmful effect on citrus yields and production.

Saharaoui *and al.* (2001) report that the impact of the leafminer parasite complex was felt much more on pre-pupae and L3 larval stages than on pupae. On lemon trees, the annual parasitism rates on pre-pupae were 15.78% in 1996, 38.90% in 1997 and 28.66% in 1998. They fluctuated between 12.45% and 22.24% on the L3 stages over the three years and never exceeded 8% on pupaein any year. On orange trees, the pre-pupal stage was the most receptive with a parasitism rate of 19.22% in 1996, 41.66% in 1997 and 20.17% in 1998. In 1998, there were no significant differences between the parasitism rates of pre-pupae (20.17%) and larvae at the L3 stage (21.11%). A decreasein the number of larvae affected by climatic changes.

Saharaoui *and al*., (2001), shows that mortality, largely linked to climatic conditions, is likely to cause high mortality in insect populations, particularly in the larval stage, whereas the pupaland chrysalis stages, protected by their cocoons, are less exposed to these factors. The high mortality recorded during the summer period was partly caused by significant spatial competition due to high larval density. On lemon trees in 1997, the rate of parasitism ranged from 10.48% (15 August) to 28.09% (30 August). In summer 1998, parasitism combined a maximum rate of 34.59% in midsummer (30 July) with a minimum rate of 0.64% at the beginning of winter (15 December) and was 7.76% in autumn (30 September). On orange trees, parasitism activity was practically nil in winter during the three years (1996, 1997, 1998) due to the lack of young shoots. The first parasite was observed around 15 May. The first parasite was observed around 15 May, when the parasitism peak was of the order of 26.03%. This rate varied from 2.21% (15 July). The parasite index was high during the first two months of the summer of 1998, when parasitism rates reached 45.66% on30 July

before dropping to 25.32% on 15 August. The hot weather caused the rate of parasitism to fall to 9.61% at the end of August. The impact of the leafminer parasite complex was felt much more on pre-pupae and L3 larval stages than on pupae. The mortality of the organisms is linked to the effect of the parasitoids.

ESTIMATING THE INFESTATION RATE

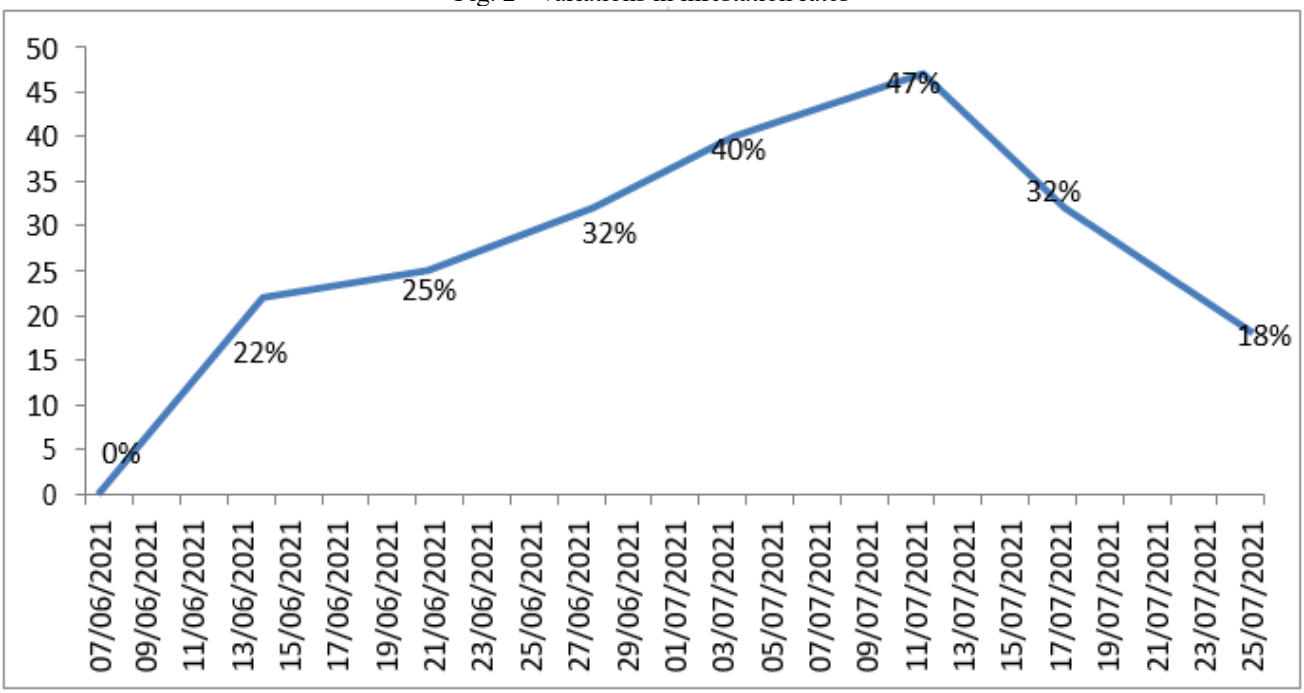
Table 2 and Figure 2 show the estimated infestation rate for June-August 2021.

Table 2 - Estimated infestation rate for June-August 2021

The dates	The rate of infestation
07-06-2021	0%
14-06-2021	22%
21-06-2021	25%
28-06-2021	32%
04-07-2021	40%
12-07-2021	47%
19-07-2021	32%
09-08-2021	18%

Source : Prepared by the authors (2024)

Fig. 2 - Variations in infestation rates



Source : Prepared by the authors (2024)

Analysis of infestation rate estimation results

Table 2 and Figure 2 show that a significant increase in the infestation rate was recorded during the period 07 June-14 June 2021, reaching 22%. This increase continued gradually until it reached its peak in the second week of July (12-07-2021) with a rate of 47% at an average temperature of 28.9°C and humidity of 57%. The infestation rate then fell, reaching a low point in the

second week of August (09-08-2021). This variation is due to the summer push period, especially in (June-August 2021).

Discussion on estimating infestation rates

Khechna *and al*. (2017) found high infestation rates for the Wachinthon variety, with 50% observed on 13 July and 60% on 24 August in 2011. An increase in the infestation rate can be explained by the appearance of the second sap burst in the second dekad of June. However, from the third sap burst onwards, the infestation rate fell. In 2012, she reported two peaks in plot 1. The first occurred on 18 July 2012 with a rate of 35% and the second, of lesser importance, was reportedon 12 September 2012 with a rate of 20%. For plot 2, three peaks of almost equal importance werenoted. The first was observed on 18 July 2012 with a rate of 37%, the second peak on 15 August ofthe same year with a rate of 35% and the third peak on 12 September with a rate of 38%.

Boualem (2009) in 2003 found that infestation rates on the second sap flush varied from 67.5% (minimum) on 9 July to 97.4% (maximum) on 26 August. On PS2. Temperatures varied, with a maximum of 38.6°C recorded on 19 July and a minimum of 16°C on 26 August. In 2004, thetrend in contamination was similar to that of the previous year, with maximum rates of 96.6% on the summer shoot in July and 95% in August, while temperatures reached minimums of 21.8°C (19/07) and 20°C (30/08) and maximums of 32.1°C (26/07) and 37°C (23/08). With the same author,and during 2005, *P. citrella* showed low activity at the start of the second sap flow. Infestation rates,which reached 10 to 13% during the month of June at an average temperature of 23.6°C and 63% humidity on 19 June, rose sharply during the summer. In fact, they reached a maximum of 89.4% in July and 99% in August, with maximum temperatures and RH of 34.9°C and 98% in July and 33.9°C and 98% in August. Infestation rates were also high in 2006. On PS2, for example, a maximum of 96% was observed in July and a minimum of 71.2% in September.

ESTIMATION OF PARASITISM RATES

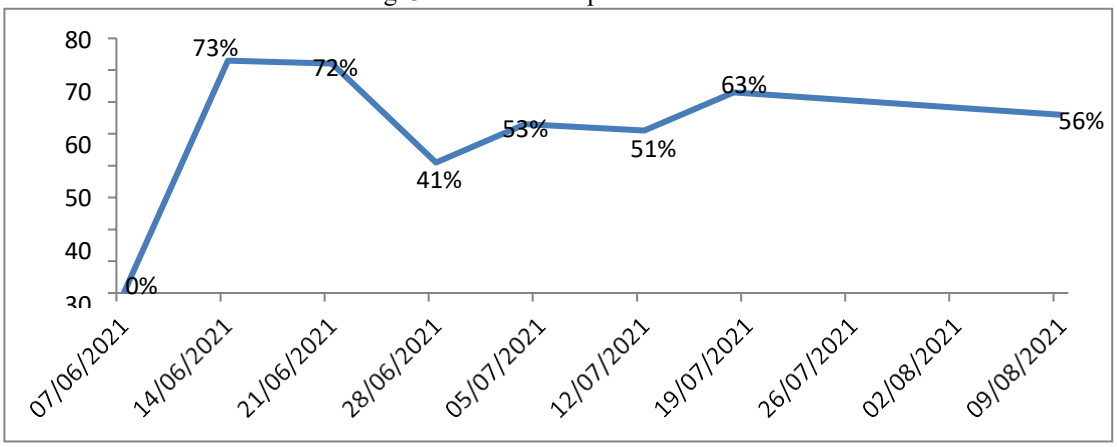
Table 3 and Figure 3 show the estimated infestation rate over the period June-August 2021.

Table 3 - Estimated rate of parasitism

The dates	The rate of parasitism
07-06-2021	0%
14-06-2021	73%
21-06-2021	72%
28-06-2021	41%
04-07-2021	53%
12-07-2021	51%
19-07-2021	63%
09-08-2021	56%

Source : Prepared by the authors (2024)

Fig. 3 - Variations in parasitism rates



Source: Prepared by the authors (2024)

Analysis of parasitism rate results

Table 3 and Figure 3 show a significant increase in the rate of parasitism, reaching two peaksof 73% and 72% for the first outing. After 28 June, there was a fluctuation in parasitism rates. This underlines the importance of the activity of beneficials. Near the clementine orchard is a greenhouse where parasitoids of the citrus leafminer, Semielacher pesiolatus in particular, are reared.

The discussion on the rate of parasitism

Khechna *and al*. (2017), show that the first rate of parasitism is noted on 29 June 2011 witha rate of 15% and the second with a rate of 20% reported on 27 July. These parasitism percentageswere recorded after the first release of citrus leafminer parasitoids (Semielacher petiolatus and Citrostichus phyllocnistoides), which was carried out after the second sap burst.

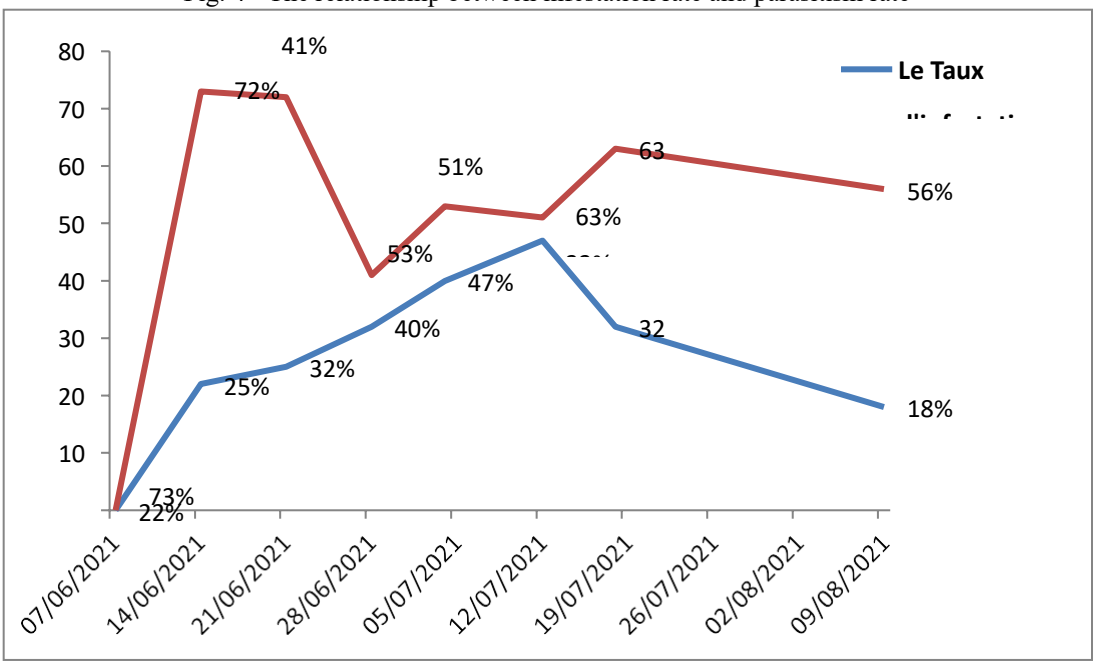
Mechelany and Matny (1998) show that the maximum level of parasitism on lemon trees is 4% in June, with an absence of parasitism from January to mid-March. On orange trees, the percentage is higher at 5%. Absence was noted in October and November and also between July/August and December/February in April. On clementines, the maximum level of parasitism is 6%, with an absence of parasitism noted from June to the end of September.

THE RELATIONSHIP BETWEEN THE RATE OF INFESTATION AND THE RATE OF PARASITISM

Table 4 and Figure 4 show the relationship between the infestation rate and the parasitism rate.

Release dates	The rate of infestation	The rate of parasitism
07-06-2021	0%	0%
14-06-2021	22%	73%
21-06-2021	25%	72%
28-06-2021	32%	41%
04-07-2021	40%	53%
12-07-2021	47%	51%
19-07-2021	32%	63%
09-08-2021	18%	56%

Fig. 4 - The relationship between infestation rate and parasitism rate



Source: Prepared by the authors (2024)

Interpretation of the relationship between the rate of parasitism and the rate of infestation

In Figure 4, the two curves plotted are those obtained in the same plot during monitoring of the crop over the period January-August 2021.

According to the results obtained in Table 4 and Figure 4, it should be noted that the parasitism rate is higher than the infestation rate. In fact, the value of the infestation rate is lower than the value of the parasitism rate.

There were two peaks in parasitism on 14 and 21 June 2021. On the other hand, for the infestation rate there is a peak on '12 July 2021'.

The relationship between the infestation rate and the parasitism rate is increasing, but the value of the parasitism rate exceeds that of the infestation rate.

The significant relationship between the rate of parasitism and the rate of infestation is due to several factors, in particular thermal variations. This can be explained by the good management and success of the biological control method using parasitoids.

Irrigation is another factor affecting the establishment of Phyllocnistis citrella. Trees that are well irrigated have a very high number of parasitized organisms.

Once the pest has settled in, there are other parameters that influence its distribution.

The distance between the clementine trees and the greenhouse. Trees closest to the greenhouse have a limited number of parasitized organisms compared with trees further from the greenhouse, which contain a very large number of parasitized organisms.

Another parameter that affects infestation is the proximity of crops. Neighbouring sides of Thomson trees contain a very large number of parasites, whereas neighbouring sides of Rosasser stone trees contain a very small number of parasites.

Another parameter that affects the distribution of harmful organisms is temperature variations, which play a very important role in the development of this pest. The peak of the parasitism rate is reached when the average temperature is 28.9°, which is a favourable temperaturefor the production of parasitism.

The increase in the rate of parasitism in relation to the rate of infestation is a result of the absence of the use of chemical treatments in the experimental orchard.

Discussion of the relationship between the rate of parasitism and the rate of infestation

KHECHNA *and al*. (2017) found in 2011 that the infestation rate is higher than the parasitism rate. This is due to pesticide treatments. The parasitism rate increased from 15 August 2012 compared with the infestation rate, which highlights the importance of the activity of beneficials. Similarly, the parasitism rate is the highest in relation to the infestation rate, increasing and reaching a maximum of 68% in summer sap shoots on 21 June 2021 (Bendoumia *and al*., 2023).

The importance of the parasitism rate in relation to the infestation rate is due to the activityof the beneficials.

CONCLUSION AND OUTLOOK

For the present study, the parasitism rate is high in this orchard because the sanitary conditionof the trees is clean ‘no pesticides are used in this orchard’. Also, the presence of greenhouses for rearing citrus leafminer parasitoids next to clementine trees favours and increases the rate of parasitism. In fact, it is interesting to install citrus leafminer parasitoid rearing greenhouses next toor in the middle of citrus trees in order to increase the rate of parasitism.

In addition, the orchard is located in the Boufarik region, where there is general containmentas

a preventive measure against the Corona virus ‘Covid-19’ pandemic. This site offers climatic conditions conducive to the development of citrus leafminer parasitoids. Containment also reducesthe atmospheric pollution that encourages pest outbreaks in general, and citrus leafminers in particular.

Finally, regional containment is a very important future solution for long-term control of the dreaded citrus leafminer as part of an integrated pest management programme. In fact, we need to propose to those responsible for the region where citrus trees are grown that a regional containment system be introduced for a period of time to be studied, in order to minimise the use of pesticides against the citrus leafminer. In addition, we need to study the bio-ecology of natural enemies in greenhouses near citrus leafminer-infested yards and incorporate them with other integrated pest management methods.

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Biomarkers related to diagnosis, prognosis and therapy in thyroid cancer

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Andressa Rissotto Machado Medeiros Lima[1] and Sarah F. V. O. Maciel[2]

ABSTRACT

Thyroid cancer (TC) is among the 10 most common neoplasms worldwide, with increasing number of cases, especially in populations with a high rate of metabolic syndromes and exposure to radiation, proving to be a great challenge to the global health system. Based on this, several studies are carried out in order to identify paths for early diagnosis and more individualized treatments. The main target of the research is biomarkers, which consist of the detection of small molecules, whether genetic material or not, which can be more expressed or suppressed with the presence of the tumor. Among them are cellular-free DNA, microRNAs, oncometabolites, and specific genetic mutations. In this way, biomarkers can contribute to more accurate and earlier tumor specificity and staging, since small quantitative changes can be easily observed. In addition to enabling other types of less aggressive treatments, encouraging permanence during the process. Thus, the present study aims to explore the main biomarkers currently being researched, as well as their roles in the diagnosis, prognosis, and therapy of thyroid cancer.

Keywords: Thyroid Cancer, Tumor Biomarkers, Prognosis, Early Diagnosis.

[1] Incomplete Higher Education
Federal University of the Southern Border
[2] Complete Doctorate
Federal University of the Southern Border

INTRODUCTION

Thyroid cancer (TC) is the most common endocrine neoplasia, falling into head and neck carcinomas. Currently, it is divided into 5 subtypes, depending on the cell type initially affected. If it derives from follicular epithelial cells, we have papillary, follicular, oncocytic and anaplastic subtypes. If it derives from parafollicular C cells, we will have medullary thyroid cancer. Regarding epidemiological data, papillary thyroid carcinoma is the most common, accounting for 80-90% of cases, but with a good prognosis, unlike anaplastic thyroid carcinoma, which represents 1% of cases, but 20% of annual mortality due to TC (MSD, 2024).

After investigation of the TC subtype with histological instruments to verify the initial cell lineage, the study of the staging of the neoplasm is performed. Currently, the TNM system is used, which focuses on the prognosis of the disease, taking into account the tumor diameter in its largest dimension, its limitation to the thyroid, the level of extrathyroidal extension, lymph node extension, and the presence of metastases (INCA, 2023).

The diagnosis for SC is made through imaging tests, especially ultrasound, which will be the basis for fine needle aspiration puncture (FNA), being the procedure of choice in the evaluation of suspicious nodules. Associated with this, the treatment used today is surgical, with partial or total thyroidectomy being performed, depending on the case, the removal of affected lymph nodes is also performed (INCA, 2023). Therefore, there are several invasive procedures, no matter how routine, affecting the continuity of investigation and treatment due to patients' fear. Based on this, the importance of biomarkers in this process is reinforced, which can be detected by specific blood tests.

Biomarkers can be defined as the result of a body's response to a given situation. They exist naturally within physiology, with specific functions or just being suppressed to maintain control of homeostasis and tumor suppression. However, when a mutation originates a tumor, for example, this event is seen as a given by the body, resulting in the abnormal production of certain molecules and proteins, which can be found in body fluids or tissues. Currently, they are called biomarkers due to their importance in detecting abnormalities, such as thyroid neoplasms (MSD, 2024).

Therefore, it is evident the importance of further studies that explore biomarkers in cases of TC, with the aim of contributing to the increase of specificity in the staging of neoplasia and in more individualized treatments, since different subtypes of TC can result in different levels of biomarkers produced. In this way, initiatives for healing can be done more efficiently and reducing the patient's discomfort during treatment.

DEVELOPMENT

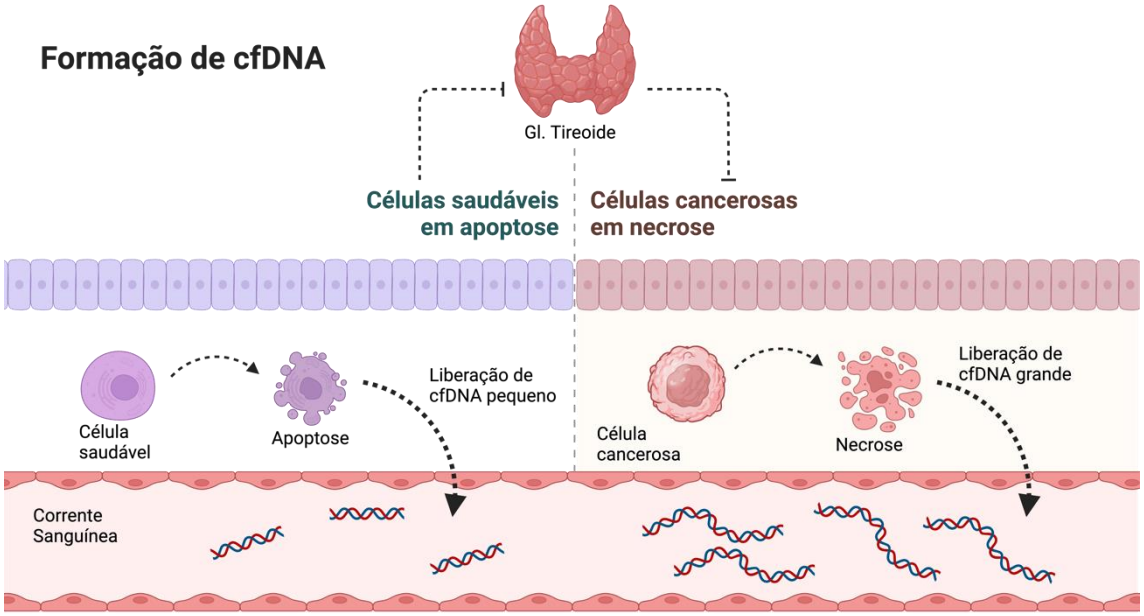
DIAGNOSIS

The diagnosis of TC involves multiple steps, mainly due to the need to stage and classify the disease correctly. The first sign is usually detected in routine exams such as palpation of the thyroid gland and lymph nodes, since this neoplasm is largely asymptomatic (INCA, 2023). Afterwards, more specific exams are performed, such as thyroid function tests, scintigraphy, tomography, ultrasonography and FNA. In the results, some main tumor markers for TC can be analyzed, such as the level of elevated serum thyroglobulin in most cases, and elevated calcitonin levels in cases of medullary thyroid neoplasia (Hou et al., 2023).

However, these analyses are still nonspecific and do not consider several biomarkers currently researched. This is the case of cell-free DNA molecules (cfDNA), which have their concentrations in the blood modified with the presence of tumors and inflammation. Its production is already present in normal physiological processes, but when tumor cells undergo necrosis, they release larger cfDNA, being called circulating tumor DNA (Figure 1). Research by Hou et al. (2023) has shown that combining multiple cfDNA can result in a more accurate diagnosis than with just one cfDNA.

Laboratory analysis of this component can be performed through polymerase chain reactions (PCR) and sequencing techniques, which enable the identification of these genetic materials in peripheral blood samples (Fussey et al., 2018). By using PCR, it was possible to identify the presence of the BRAFV600E mutation in individuals with the neoplasm (Pupilli et al.) and differentiate it from malignant cases (Fussey et al., 2018). In addition, according to Zane et al. (2013), it was possible to identify a higher concentration of cfDNA in patients with papillary SC than in healthy people. Thus, it can be used as an effective biomarker for diagnosis and prognosis.

Figure 1: Illustrates the difference between the size of cfDNAs produced by healthy cells and cancer cells in the context of the thyroid gland.



In addition, microRNAs are other excellent biomarkers that can favor the specificity of the diagnosis of TC. They are endogenous non-coding small molecules whose function is to bind to specific mRNAs, which produces an inhibition response of the protein that would be originated. This process can be beneficial, by suppressing the expression of tumor suppressor proteins, but it can be harmful by preventing the gene expression of tumor suppressors, thus favoring oncogenesis (Geropoulos et al., 2022).

Tumor characteristics also result in different miRNAs, such as tumor size, location, extrathyroidal extension, lymph node metastases, etc. It is also noteworthy that after a thyroidectomy, about 31 circulating miRNAs are altered, two of which are associated with recurrence of papillary TC. Therefore, it is a very present marker that can be detected in blood tests, but there is still a need for more research to specify which tumor miRNAs are, since other cells can also produce them (Geropoulos et al., 2022).

As in the case of free DNA molecules, miRNAs can offer more accurate diagnoses if their serum expressions are combined with the use of ultrasonography, as detected by Zhang et al. (2007). The researchers combined miR-222, miR-221, miR-146b, and miR-21, resulting in a specificity of more than 90% in papillary SC cases. Therefore, biomarkers are increasingly shown to be very efficient in the process of diagnosing TC.

Another group of biomarkers currently being studied are the oncometabolites, which are the metabolites produced by the biochemical processes of cancer cells, which differentiate them from healthy cells. Several molecules are part of this group, such as glucose, fumarate, succinate, asparagine, glutamine, lactate, among others. This is due to the fact that cancer cells need to maintain their metabolism accelerated for growth, with a greater capacity to capture glucose and lactate in the

process of aerobic glycolysis, which is capable of modifying the pH of the tumor site (KHATAMI et al., 2019).

In the case of papillary thyroid cancer, a significant increase in mRNA encoding metabolic enzymes was detected compared to healthy patients, which corroborates its importance as a biomarker. The quantification of these markers may contribute to the diagnosis, while high levels of lactate and choline and low levels of citrate, glutamine and glutamate are found in cases of TC. Citrate and lactate stand out as the most significant oncometapolites (KHATAMI et al., 2019).

Thus, the diagnosis stage is extremely important when elucidating the characteristics of the tumor, such as size and metastases, as well as its specific biomarkers. This set of information serves as a basis for the prognosis and the treatment that will be performed.

PROGNOSIS

The prognosis of CT refers to the possible referrals that the neoplasm may follow based on what is known today. This process mainly takes into account the tumor characteristics present in the staging (diameter, metastases, lymph nodes, etc.) and the history of disease recurrence. Tumor multifocality is also a negative prognostic aspect, as it is associated with central lymph node metastasis, being a risk factor for the extrathyroid region (Cui et al., 2022). Based on this, it is possible to draw a profile of how the tumor will proceed and grow, with the aim of applying the most appropriate therapies.

Tumor characteristics are caused by genetic mutations, which can be hereditary or acquired throughout life. The BRAFV600E mutation is one of the best known in the case of TC, it is more related to recurrence and mortality in cases of papillary thyroid cancer (Cui et al., 2022).

Other mutations can lead to elevated expression of biomarkers, such as CD133 related to poor prognosis in cases of medullary thyroid carcinoma; CD44 is a regulator of tumor epithelial transformation and is related to poor overall survival; CD24 with a positive prognosis related to better survival and no recurrence; CD10 highly expressed in anaplastic thyroid carcinoma; CD15 related to improved survival without recurrence; and ALDH1 linked to the mediation of resistance to chemotherapy drugs and cellular detoxification (Peng et al., 2024).

TREATMENT

The *American Thyroid Association* defines cure for TC as the absence of clinical or radiographic evidence of a tumor, and undetectable serum thyroglobulin levels. To this end, the information present in the diagnosis (subtype of the neoplasm and its staging) and prognosis (recurrence and genetic aspects) are analyzed.

Some specific mutations may contribute to this phase of treatment, such as CD133-expressing cells, which may be better treated with radioactive iodine. On the other hand, cells that express CD44 show greater proliferative capacity and greater resistance to treatment, as is the case with ALDH1, but this is an important prognostic factor exclusive to TC, having high potential in future therapies (Peng et al., 2024).

Treatments are currently based on surgical procedures, which are extremely invasive, as is the case with medullary thyroid cancer, in which the *British Thyroid Foundation's recommendation* is a total thyroidectomy and central nodal clearance with lateral clearance of the neck if there is evidence of central nodal disease (Cosway et al., 2022).

After thyroidectomy, postoperative radiation therapy may be performed with the goal of removing all thyroid tissue. It allows for better screening in cases of recurrence of the neoplasm and helps in the interpretation of thyroglobulin levels during recovery. If the disease is of intermediate or high risk, levothyroxine is applied in order to suppress the thyrotropin concentration and prevent the growth of TC again. Monitoring is done based on periodic thyroglobulin and antithyroglobulin antibody tests and ultrasonography with an interval of 5 years after post-surgical monitoring (MSD, 2023).

The choice of surgery can be avoided depending on the size of the tumor, as long as ultrasound follow-up is maintained. Another option in cases of small tumors is hemithyroidectomy, which can offer a better quality of life to the patient and has a good prognosis (MSD, 2023).

CONCLUSION

TC is a global health problem on the rise, even though it does not present high levels of mortality, it is a silent disease that in most cases is asymptomatic. In addition, after being discovered, the treatments offered today are mostly surgical, which makes them invasive and implies patient adherence. Based on this, research has been carried out on new forms of early and more specific diagnosis, among them, we have biomarkers.

Biomarkers are molecules that are more expressed or suppressed compared to healthy individuals, which can indicate the presence of tumor cells in the thyroid gland, as well as their subtype and staging. Among the main biomarkers are cellular-free DNA, miRNA, and oncometapolites. These provide guiding parameters about tumor extension and the most specific treatment that can be used. As for prognosis, the analysis of genetic markers is extremely important since some mutations are related to greater tumor recurrence, better prognosis or resistance to chemotherapy.

Thus, with the greater number of studies in the area, tests for biomarkers can contribute to the early detection of TC through simple blood tests, which would make them more viable for the

population compared to FNA testing. In addition, treatments could be more individualized and more effective, avoiding surgical procedures and follow-ups for the rest of life.

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Analysis of the basic interest rate on pre-fixed working capital for legal entities

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Joélcio Braga de Sousa[1], Thiago Edirsandro Albuquerque Norman[2], Gesiel Rios Lopes[3], Christiane Carvalho Veloso[4], Pedro Henrique dos Santos Mendes[5], Davi Mesquita Freitas[6], Marcio Henrique Yacyszyn Rodrigues[7] and Maria Larissa Oliveira Silva[8]

ABSTRACT

The present work seeks to analyze the impact of the basic interest rate practiced by the Central Bank of Brazil (Bacen) through COPOM and its impact on the interest rates practiced by some Brazilian financial institutions, especially in working capital loans to Legal Entities (PJ). The Brazilian basic interest rate, known as Selic, is one of the main variables that influence the cost of credit for these institutions. Any fluctuation in the Selic rate can trigger changes in several market metrics, such as foreign trade and inflation. In view of the various developments of the impact that the Selic may cause, it was decided to address its effect on credit lines for companies, especially in the Working Capital modality with a term of up to 365 days – Pre-Fixed. To this end, a survey was carried out of companies with more than 2% participation in the Ibovespa Index, and public institutions with mixed capital had their interest rates monitored by the Central Bank.

Keywords: Selic, Interest, Financing, Copom.

[1] Master in Administration and Accounting. Fucape Business School. Rua Veterinário Bugyja Brito, 1354, Teresina, PI, 64066-050.
E-mail:Joelcio.sousa@unifacid.edu.br
[2] Master in Biotechnology.Unifacid Wyden. Rua Veterinário Bugyja Brito, 1354 – Teresina – Piauí, Teresina, PI, 64066-050.
E-mail: thiago.normandoadv@gmail.com
[3] Doctor in Computer Science. USP. Av.Trab São Carlense, 400, São Carlos, SP, 13566-59.
E-mail:gesielrios@gmail.com
[4] Doctor in Administration and Accounting. Fucape Business Shool. Avenida Universitária, Teresina, PI,64049550
E-mail: christiane.veloso@ufpi.edu.br
[5] Higher academic background with the area. Training institution. Institutional Address.
E-mail: henriqueholy@ufpi.edu.br
[6] Graduating in Accounting.UFPI. Avenida Universitária, Teresina, PI,64049550, Teresina, PI, 64066-050
E-mail: davi2@outlook.com
[7] Bachelor of Accounting Unifacid Wyden. Rua Veterinário Bugyja Brito, 1354, Teresina, PI, 64066-050.
E-mail: claraclarinha987@gmail.com
[8] Graduated in Business Administration Rua Veterinário Bugyja Brito, 1354, Teresina, PI, 64066-050.
E-mail: srtalalaoliveira20@gmail.com

INTRODUCTION

The Selic (Special System of Settlement and Custody) is used as an instrument of economic actions related to financial control to control inflation and regulate the economy, it was created in the early 1990s, whose calculation is based on the average of the financial operations of the day, backed by federal government securities that are registered in the Selic (Vartanian *et al*, 2019).

In this way, when the Central Bank increases the Selic rate, it gradually increases interest rates, this leads to some obstacles for companies, such as the search for resources necessary to finance a company's operating activities becomes more difficult, because if the company is in debt, it will have little chance of getting loans, financing and also the availability of working capital necessary to cover operating expenses, such as payment of employees and suppliers. Working capital, in turn, becomes more costly, due to the increase in the cost of credit, which negatively affects the company's cash flow and capacity for expansion and innovation, as it is intrinsic to the Selic balance. This increase is related to inflation control, fiscal balance and the defense of the currency.

On the other hand, fluctuations in the prices of financial assets, by altering the stock of wealth of economic agents, can influence consumption decisions. A reduction in the basic interest rate, by stimulating economic growth, increases the profit expectation of companies, usually generating an increase in the price of shares (Modenesi, 2022). The cost of working capital increases due to the increase in the cost of credit. This can generate a ripple effect: companies face greater difficulty in obtaining financing at competitive rates, which in turn can negatively affect cash flow and the ability to invest in expansion and innovation.

The research problem of this work is to identify and analyze the main practices of the correlation of the variation of the interest of capital from 365 to PJ of some banks to the Selic.

This study is justified by the need to understand the interest rate fluctuations of different banks with the Selic.

THEORETICAL FRAMEWORK

The Selic Rate was created by Presidential Decree No. 3,088 of June 21, 1999 and regulated by BCB Circular No. 2,900 of June 24, 1999, being the monetary policy tool adopted by the Inflation Targeting Regime implemented in Brazil, it ended up replacing the TBC and TBAN, being used by COPOM until then (Arida and Resente, 2005; Oliveira, 2024).

According to (Oliveira and Costa, 2005; Ribeiro, 2020) The Selic rate is one of the main indicators of the financial market and makes inflation levels under control, causing the government to stimulate the economy and economic growth through its balancing. "The Selic Rate is also

considered as a type of benchmark, ceiling, for the interest paid by banks on term deposits, from this, banks estimate the interest that will be charged on loans granted to companies and individuals.

It reports that Legal Entities are the ones that are most influenced by the SELIC, so when the SELIC is high, the rate will also be higher and when the SELIC is low, the rate will also be low. Thus, impacts with the increase in the Selic rate for legal entities are, Companies that depend on long-term investments are also affected, since the increase in interest rates can make certain types of investments, such as long-term infrastructure projects, less attractive (Medeiros, 2019).

In view of the existence of lags in the conduct of monetary policy, the Central Bank acts prospectively; that is, the Selic rate is calibrated according to inflation expectations: the identification of an inflation trajectory higher (lower) than the target requires an increase (reduction) in the interest rate

The Selic interest rate, which, in turn, is obtained through the so-called daily liquidity management compatible with the inflation target. In view of the existence of lags in the conduct of monetary policy, the Central Bank acts prospectively; that is, the Selic rate is calibrated according to the inflation expectation: the identification of an inflation trajectory higher (lower) than the target requires an increase (reduction) in the interest rate (Moreira, 2009)

The rate of interest is fundamentally determined by the ratio of the supply of money that people are willing to lend to the number of individuals who wish to borrow from them. This rate varies greatly from season to season. Economists take 16 this fact as a "market phenomenon", such as the price of common commodities or the price of food, which also depend on supply and demand, causing interest rates to be determined by the interaction of these forces in the markets where money is available (Farias, 2013).

Knowledge of the future interest rate helps economic agents in the formation of expectations, consumption, investment and production decisions, as well as in the conduct of monetary policy. Because the short-term basic interest rate influences the other rates in the economy, probable scenarios and estimates of the most diverse rates and prices can be drawn (Passos, 2023;).

In the economic scenario, the interest rate plays a fundamental role acting as a mechanism for regulating housing policies, so it is necessary to explain the role, concepts and behavior of basic interest rates in Brazil in recent years. In Brazil, the Selic (Special Settlement and Custody System) is used as the basic interest rate. The increase or decrease in interest rates can have different repercussions according to the universe with which the variable is applied. Interest on its rise, for example, can mean gain in the case of a financial investment, where profitability is expected or it can mean loss for those who, for example, want to finance a property and have in the reduction of the rate an expectation to be able to reduce an installment to be paid (Ribeiro, 2019)

METHODOLOGY

This study aims to evaluate the impact of the basic interest rate, Selic, on the variation of Working Capital interest with a term of up to 365 days – Pre-Fixed for Legal Entities. As a sample, the financial companies that make up the Ibovespa Index have more than 2% participation in the index. Mixed-capital companies with a history of interest rates were also separated from interest rates during the year 2020.

First, a correlation was made with the interest on capital practiced by the banks analyzed and the history of the basic interest rate. Next, the relationship between the interest rate and the Selic was verified and a trend line of interest rates practiced by banks was drawn.

A logistic regression was performed as a way to measure the odds ratio of the Selic variation in the banks' rate. To do so, the values were exchanged for dichotomous variables, 0 and 1. It should be noted that during the year 2020, the meetings from the 237th to the 236th of COPOM were analyzed and the following financial institutions were analyzed, Banco do Estado de Sergipe, Banco da Amazônia, Banco Itaú, Banco Bradesco, Banco do Nordeste, Banco do Brasil, Banco do Estado do Rio Grande do Sul and Caixa.

LOGISTIC REGRESSION

Logistic regression is usually used for binary variables, 0 and 1. This type of methodology is used for polls of voting intentions, yes or no, democracy or no (Nicolau, 2007; Soares, 2000, Epstein *et al2013).*

In logistic regression, the target or dependent variable assumes a value of 1, as it is the variable of interest, and the independent variable assumes a value of 0. By means of logistic regression, it is possible to analyze the odds ratio of the independent variables over the dependent variable. With each unit that is increased from X, how much influences the increase of Y.

LINEAR CORRELATION

Linear correlation aims to verify whether the relationship between two variables has a positive or negative trend. A positive trend indicates that the increase in one of the variables is also followed by the increase in the other variable – but it is not a cause-and-consequence relationship.

In this case, the correlation will generate a number that will vary from 0 to +1, where the closer to 1 the value is, the stronger this correlation between the two variables will be.

A negative trend indicates that the increase in one of the variables is accompanied by a reduction in the other variable. In this case, the correlation ranges from -1 to 0, where -1 indicates a stronger correlation between the two variables. In both cases, in order for the result found to be extrapolated to the population from which the sample originated and to consider it in a certain way a

pattern of relationship, this correlation must be significant, that is, it must present a value less than or equal to 0.05. In the chart below, it is possible to see the level of correlation between the working capital interest charged by financial institutions and the Selic.

Table 1. Correlation between Banks and Selic

Correlation	Selic	Type of Company
B. Est. De Ser	0,81	Mixed
B. Amazon	0,78	Mixed
B.Itaú	0,72	Private
Box	0,72	Public
B.Bradesco	0,57	Private
B. Northeast	0,37	Mixed
B.Brazil	0,29	Mixed
B. of the State of RS	-0,31	Mixed

Source: Prepared by the authors themselves

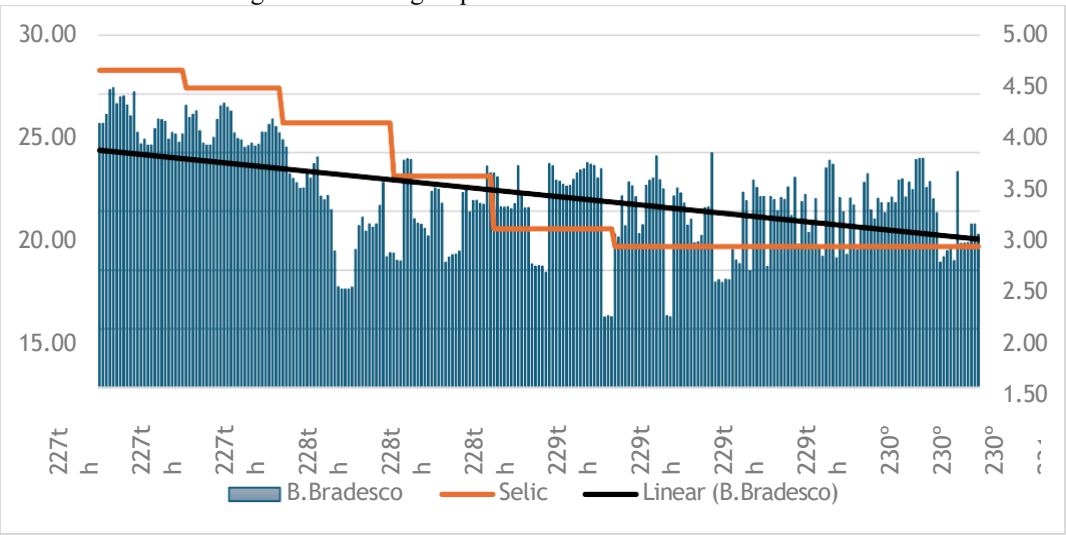
In the graph, it is thus possible to observe the level of correlation of the variation of the interest rate of 365 for PJ of some banks with the Selic. However, it is not possible to draw many conclusions from the table above, only that the interest rates of banks, with the exception of the Bank of Rio Grande do Sul, tend to increase the interest on working capital in the event of an increase. It should be noted that due to a period of analysis, the country was going through a pandemic. The graphs below will detail the ratio of the working capital interest rate for legal entities of the financial institutions under study, Selic and the trend line of the interest rates practiced by the financial institutions.

The methodology of an article outlines the procedures employed to conduct the research, including the type of study, sample selection, methods of data collection and analysis, ethical considerations, and limitations of the study. Its detailed and transparent description is essential to ensure the replicability and reliability of the results, in addition to providing a solid basis for the interpretation and generalization of the findings.

RESULTS AND DISCUSSIONS

In the graphs below, it will be possible to verify the relationship between the interest rates charged by the Central Bank through COPOM during the year 2022, interest rates charged by the financing institutions, the trend line of interest rates charged by the institutions, and the odds ratio measured through logistic regression by analyzing the study variables.

Figure 2. Working Capital Interest of Banco do Bradesco



Source: Elaboration authors

The analysis carried out was between the meeting of No. 227 and No. 226 of the Copom. Meeting No. 227 took place on December 10 and 11, 2023 and meeting No. 236 took place on June 15 and 16, 2024. Between 12/11/2023 and 06/16/2024, 188 days passed, within this interval there were oscillations in the Selic target to changes in the interest rates practiced by banks. Following the information from the Central Bank itself, every adjustment in the Selic rate takes 6 to 9 months to impact the market, with its main developments being in the exchange rate, credit, market expectations and investments. Between meeting No. 226 and No. 229, the average interest rate practiced by Banco Bradesco was 19%. This can be seen in the chart above. However, the reduction in the bank's interest rate did not happen immediately, the reduction in the Selic rate. Even during the period of maintaining the basic interest rate at 2%, the interest rate practiced by the bank was not constant, with oscillations up and down during the period. However, it is worth mentioning that the trend line shows that the reduction in the bank's interest rate in the long term followed the Selic.

Figure 3. Logistic Regression Banco do Bradesco

Logistic regression — Number of obs = 255
LR chi2(1) = 0.23
Prob > chi2 = 0.6318
Log likelihood = -176.30618 — Pseudo R2 = 0.0007

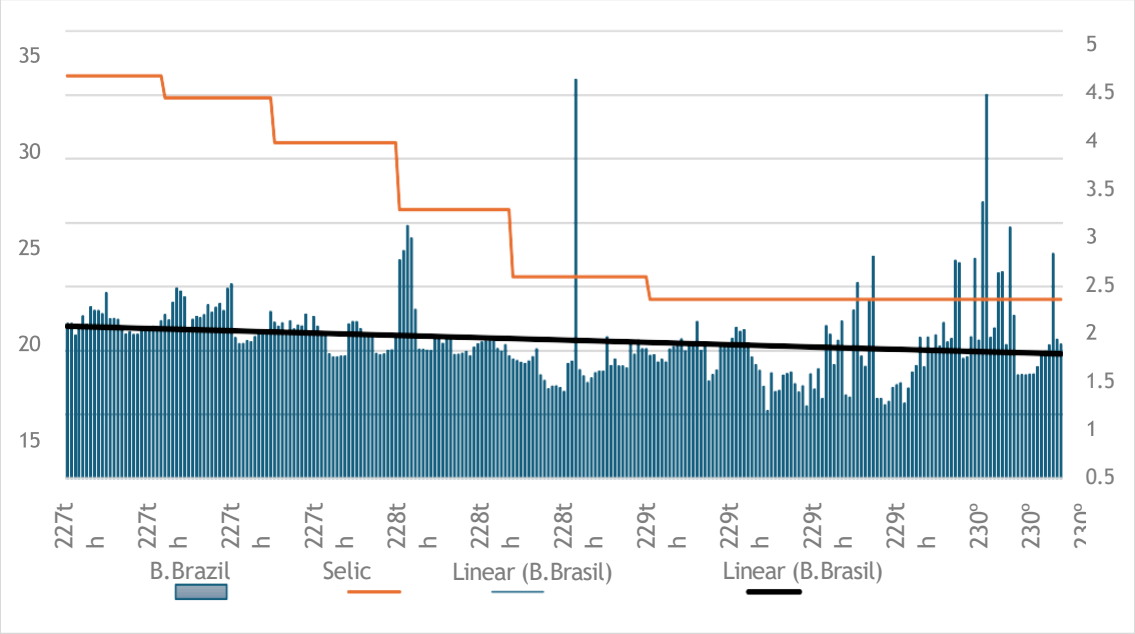
bbradesco	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
selic	1.223765	.5158899	0.48	0.632	.5356315	2.795956
_cons	.8852459	.1169596	-0.92	0.356	.6832856	1.1469

Source: Elaboration authors

The odds ratio for "selic" is 1.223765, suggesting that an increase of one unit in the Selic rate is associated with a 22.38% increase in the chances of the event associated with "bbradesco". However, the p-value (0.632) indicates that this coefficient is not statistically significant, as it is much higher than the usual level of significance (0.05). Therefore, there is not enough evidence to

conclude that "selic" has a significant effect on "bbradesco". The LR chi2 was 0.23, this is the value of the likelihood ratio test. It compares the probability of seeing the data under the full model versus a simpler model. The rob > chi2 was 0.6318, this is the p-value associated with the likelihood ratio test. A high p-value (usually greater than 0.05) indicates that there is insufficient evidence to reject the null hypothesis. The Pseudo R2 was 0.0007. This is an analogue to R-squared in linear regression, which represents the proportion of variance explained by the model. The results of the logistic regression show that the variable "selic" does not have a statistically significant effect on "bbradesco" in the analyzed sample. The low chi-square statistic and the high p-value indicate that the model as a whole is also not significant.

Figure 4. Banco do Brasil's Working Capital Interest



Source: Elaboration authors

This analysis indicates that the impact of changes in the Selic rate on the interest rates practiced by Banco do Brasil occurs with a certain time lag and may present variability due to various factors in the financial market. What can be observed is that there is a trend in the bank's interest rate falling, but very tenuous, compared to the Selic. On average, the interest rate practiced in the period was 10.81%, another factor was the correlation between the interest charged by the bank and the interest rate, which was 0.29. It should be noted that the bank in question is a mixed economy and has the federal government as the majority partner.

Figure 5. Logistic Regression Banco do Brasil

```
. logistic bbrasil selic

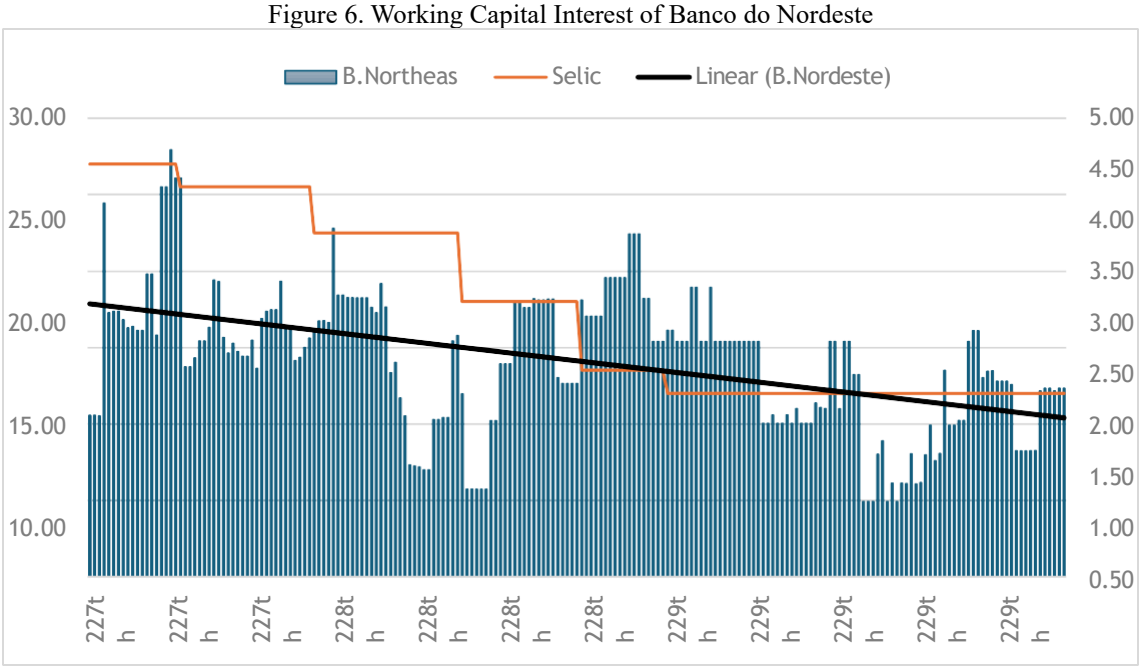
Logistic regression                                     Number of obs   =        255
                                                        LR chi2(1)      =       0.01
                                                        Prob > chi2     =     0.9074
Log likelihood = -175.51831                             Pseudo R2       =     0.0000

------------------------------------------------------------------------------
     bbrasil | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       selic |   1.050505   .4455548     0.12   0.908     .4574828    2.412246
       _cons |   1.211538   .1605089     1.45   0.148     .9344735    1.570751
------------------------------------------------------------------------------
```

Source: Elaboration authors

For each increase of one unit in the selic, the chance of the bank's rate being adjusted increases by 1.050505 times (an increase of 5.05%) (1.050505 - 1 = 0.0387), keeping the other conditions constant. This result shows that the variation in the banks' rate is little influenced by the Selic oscillation. This is also proven by several other indicators, low correlation and the Pseudo R^2. The Pseudo R^2 was 0.0000, indicating that the logistic model could not explain any variation in relation to the null model, Selic. The value of LR $chi^2(1)$ is 0.01 with a p-value (Prob > chi^2) of 0.9074, indicating that the model is not statistically significant.

Figure 6. Working Capital Interest of Banco do Nordeste



Source: Elaboration authors

It can be observed that there is no uniformity in the interest rates practiced by Banco do Nordeste. Even in periods of Selic cuts, there was an increase in the internal interest rates practiced by the bank. Correlation is not a cause, that said, even if there is a correlation of 0.37 between both variables, it is not possible to say the reasons for the fluctuations in the interest rates practiced by the financial institution. It is worth mentioning that the interest in this chart is related to Working Capital with a term of up to 365 days – Pre-Fixed for Legal Entities. Therefore, it can be inferred that any upward fluctuation in the interest rates charged by the bank discourages access to credit.

Figure 7. Logistic Regression of Banco Bradesco

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. logistic bnordeste selic

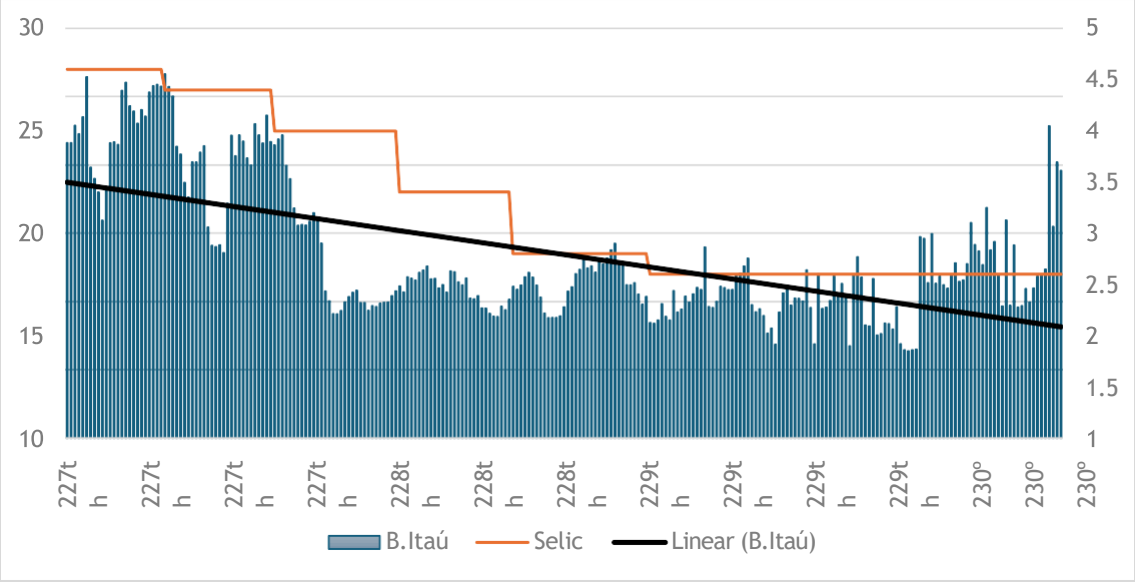
Logistic regression                                     Number of obs   =        205
                                                        LR chi2(1)      =       0.33
                                                        Prob > chi2     =     0.5644
Log likelihood = -141.37982                             Pseudo R2       =     0.0012

------------------------------------------------------------------------------
   bnordeste | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       selic |   1.320261   .6369858     0.58   0.565     .5128391    3.398902
       _cons |   .8415842   .1238751    -1.17   0.241     .6306768    1.123022
------------------------------------------------------------------------------
```

Source: Elaboration authors

For each increase of one unit in the selic, the chance of the bank's rate being adjusted (1.320261 - 1 = 0.320261) increases by 1.320261 times (an increase of 32.03%), keeping the other conditions constant. The Pseudo R^2 is a measure that attempts to capture the variation explained by the model, similar to the R^2 in linear regression. A value of 0.0012 is extremely low, indicating that the model barely accounts for the variation in the response variable. Prob > chi2, represents the p-value of the chi-square test. A value of 0.5644 indicates that the model is not statistically significant (it is generally considered significant if $p< 0.05$). In other words, there is not enough evidence to affirm that the model with the "selic" variable is better than a model without predictors.

Figure 8. Working Capital Interest of Banco do Itaú



Source: Elaboration authors

In the graph, it can be seen a significant drop in the interest rates practiced by Banco Itaú after the 229th meeting. However, it can be seen that interest rates are not uniform, similar to what happens with the Selic. It is also possible to verify that even in periods of cut-off of a meeting, such as in the 231st, the interest charged by the institution in question fluctuates more and less. Of the private banks analyzed, it was the one that showed the highest correlation with the COPOM rate, of 0.72. However, it is not possible to say.

Figure 9. Logistic Regression of Banco Itaú

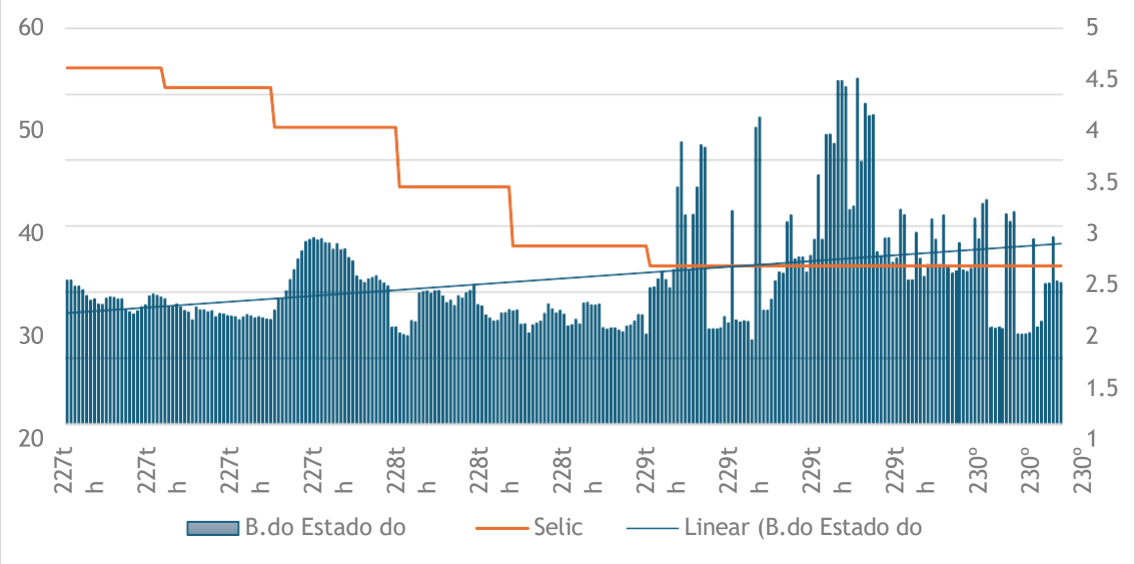
```
Logistic regression                             Number of obs   =        255
                                                LR chi2(1)      =       0.13
                                                Prob > chi2     =     0.7225
Log likelihood = -176.59337                     Pseudo R2       =     0.0004
```

bita	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
selic	1.161411	.4895439	0.36	0.723	.5083912	2.653225
_cons	.9327731	.123085	-0.53	0.598	.720203	1.208084

Source: Elaboration authors

For each increase of one unit in the selic, the chance of the bank's rate being adjusted increases by 1.161411 times (an increase of 16.14%) (1.161411 - 1 = 0.161411), keeping the other conditions constant. However, the p-value (0.723) indicates that this coefficient is not statistically significant, as it is much higher than the usual level of significance (0.05). Thus, there is not enough evidence to conclude that "selic" has a significant effect on "Itaú". Likelihood ratio (LR chi2(1)): This is the value of the chi-square test of the likelihood ratio. A higher value indicates a better fit of the model. In this case, the value is 0.13. Prob > chi2 is the p-value of the chi-square test of the likelihood ratio. A value less than 0.05 usually indicates that the model is significant. In this case, the value is 0.7225, indicating that the model is not statistically significant. Log likelihood is the logarithm of the likelihood function. The higher the value, the better the model fits the data. In this case, the value is -176.599337. Pseudo R2 is an analogue of R-squared in linear regression. It ranges from 0 to 1, and a higher value indicates a better fit of the model, in this case, the value is 0.0004, indicating that the model does not fit well with the data.

Figure 10. Working Capital Interest of the Bank of the State of Rio Grande do Sul



Source: Elaboration authors

Based on the graph, it can be inferred that even with the Selic cuts, there were fluctuations in the interest rates practiced by Banrisul. This volatility is similar to that of the other financial

institutions in our study. What can be inferred is that the correlation with the Selic goes in opposite directions during the 232nd and 233rd meetings and this can be seen in the correlation table, but taking into account all meetings. Finally, it is not possible to determine the reasons why this oscillation in the interest rate of the institution under study occurred, but we can conclude that its increase reflects on the cost of credit of companies that are in need of resources for their working capital.

Figure 11. Logistic Regression Bank of the State Bank of Rio Grande do Sul

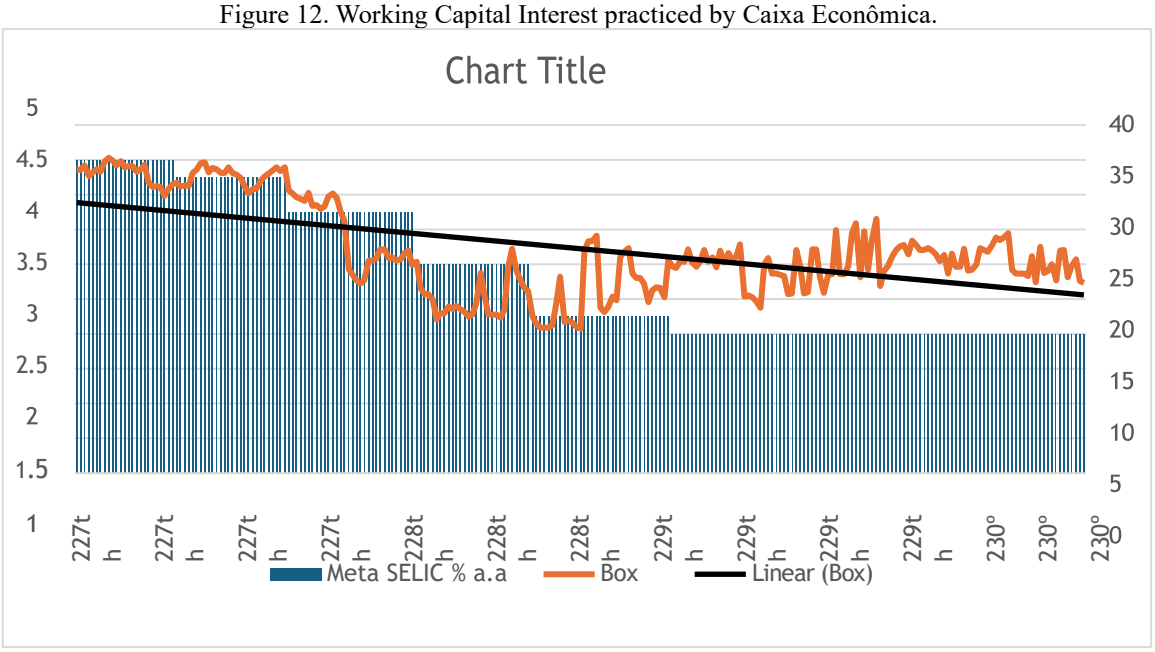
Logistic regression — Number of obs = 255; LR chi2(1) = 0.00; Prob > chi2 = 0.9473; Log likelihood = -176.65426; Pseudo R2 = 0.0000

bers	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
selic	1.028249	.4334035	0.07	0.947	.4501108	2.348967
_cons	1.053571	.1389882	0.40	0.692	.8135282	1.364443

Source: Elaboration authors

For each increase of one unit in the selic, the chance of the bank's rate being adjusted increases by 1.028249 times (an increase of 2.25%) (1.028249 - 1 = 0.28249), keeping the other conditions constant. LR chi2 of 0.23, this is the value of the likelihood ratio test, it compares the probability of seeing the data under the full model against a simpler model. Prob > chi2 of 0.6318 is the p-value associated with the likelihood ratio test. A high p-value (usually greater than 0.05) indicates that there is insufficient evidence to reject the null hypothesis. Overall, the results indicate that the adjusted logistic regression model does not have significant predictive power. Neither the coefficient of the "selic" variable nor the intercept are statistically significant.

Figure 12. Working Capital Interest practiced by Caixa Econômica.



Source: Elaboration authors

It can be seen that the interest rate of Caixa and Selic in the long term follow the same trend. Based on the graph, it is not possible to infer the cause of the fall in the rate practiced by the financial institution, but its correlation with the rate practiced by COPOM of 0.79, shows a certain adherence. Even in the period of Selic cuts, the interest charged by Caixa, referring to 365-day working capital for legal entities, fluctuated up and down. It should be noted that oscillations for more expensive the credit taken by companies and consequently increase the price of services or products offered by the borrower. However, it is not possible to determine the factors that contributed to the fluctuations in the interest rates of the financial institution in question.

Figure 13. Caixa Econômica Logistic Regression

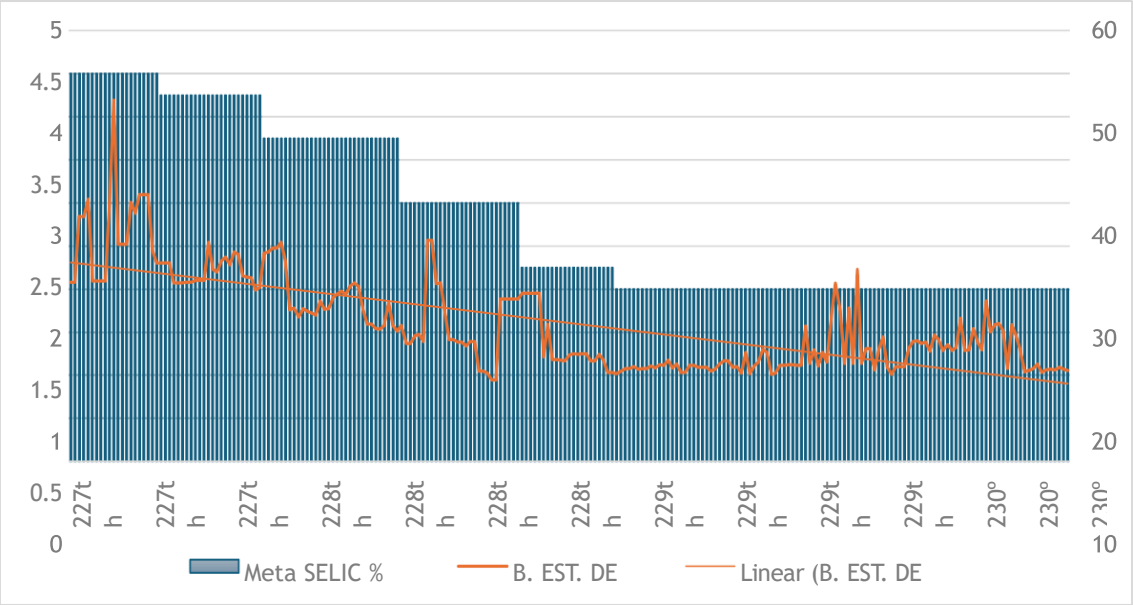
```
Logistic regression                               Number of obs   =        253
                                                  LR chi2(1)      =       0.24
                                                  Prob > chi2     =     0.6261
Log likelihood = -175.15071                       Pseudo R2       =     0.0007

------------------------------------------------------------------------------
       caixa | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       selic |    1.22884   .5211889     0.49   0.627     .5351488    2.821734
       _cons |   1.035714   .1372048     0.26   0.791     .7988739     1.34277
------------------------------------------------------------------------------
```

Source: Elaboration authors

For each increase of one unit in the selic, the chance of the bank's rate being adjusted increases by 1.22884 times (an increase of 22.88%) (1.22884 - 1 = 0.0387), keeping the other conditions constant. This result shows that the variation in the banks' rate is little influenced by the Selic oscillation. A pseudo R^2 of 0.0007 indicates that the logistic model explains a very small amount of the variation in the dependent variable compared to the null model. In other words, the independent variables included in the model ("selic") have almost zero explanatory power over the dependent variable ("box"). This value suggests that the fitted model is not significantly better than a model without independent variables.

Figure 14 Working Capital Interest practiced by Banco do Estado de Sergipe



Source: Elaboration authors

Of all the banks analyzed, the Bando do Estado de Sergipe was the one with the highest correlation with the Selic rate. It can be observed that the interest rates charged by the bank continue on a downward trend, similar to the Selic. However, it is possible to see a certain volatility in the interest rates practiced by the bank, even in periods of COPOM cuts.

Figure 15. Logistic Regression Bank of the State of Sergipe

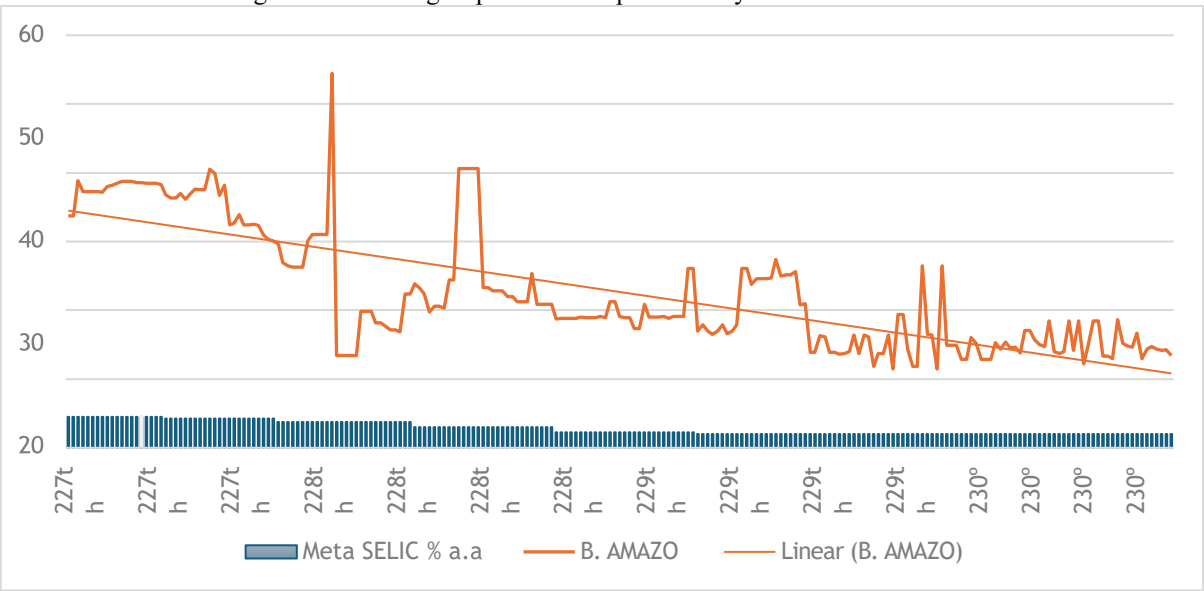
```
Logistic regression                             Number of obs   =        233
                                                LR chi2(1)      =       0.00
                                                Prob > chi2     =     0.9984
Log likelihood = -161.24354                     Pseudo R2       =     0.0000
```

bess	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
selic	1.000901	.4584728	0.00	0.998	.4078398	2.456363
_cons	1.09901	.1511288	0.69	0.492	.8393629	1.438976

Source: Elaboration authors

Overall, this model does not seem to be adequate to predict the dependent variable based on the data provided, since none of the coefficients is statistically significant and the explanatory power of the model is practically nil. Pseudo R2 indicates that the model does not account for the variation in the data.

Figure 16. Working Capital Interest practiced by Banco da Amazônia.



Source: Elaboration authors

Banco da Amazônia S.A.'s rates have a complex relationship with the SELIC, with fluctuations and moments of divergence, demonstrating that factors other than the SELIC influence its decisions. Banco da Amazônia S.A.'s rates ranged from 11.46% to 54.45% during the analyzed period, while the SELIC rate ranged from 2% to 4.5%. The bank's rates showed a higher percentage variation than the SELIC, and its correlation with the rate practiced by COPOM of 0.78 shows a certain tendency of the bank to follow the SELIC.

Figure 17. Logistic Regression Banco da Amazônia.

```
Logistic regression                             Number of obs   =        227
                                                LR chi2(1)      =       0.05
                                                Prob > chi2     =     0.8303
Log likelihood = -154.91423                     Pseudo R2       =     0.0001
```

bamaz	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
selic	1.106405	.5210535	0.21	0.830	.439589	2.784719
_cons	.7394958	.1039695	-2.15	0.032	.5613851	.9741157

Source: Elaborated by author

The odds ratio for "selic" is 1.106405, suggesting that a one-unit increase in the Selic rate is associated with a 10.64% increase in the odds of the event associated with "bamaz". However, the p-value (0.830) indicates that this coefficient is not statistically significant, as it is much higher than the usual level of significance (0.05). Therefore, there is not enough evidence to conclude that "selic" has a significant effect on Banco Amazônia.

FINAL CONSIDERATIONS

The main objective of this work was to analyze the impact of the basic interest rate practiced by the Central Bank through COPOM on the interest rates practiced by financial institutions in the Working Capital modality with a term of up to 365 days – Pre-Fixed for PJ. It should be noted that, in addition, it was sought to verify the odds ratio of the variation of the basic interest rate practiced by COPOM, Selic in the variation of interest rates practiced by financial institutions through *odds ratio.*

With the results obtained, it was found that among the institutions studied, all followed the same trend of reducing the interest rates practiced by COPOM. However, even during the period of the Selic cut, there were situations of high interest rates practiced by the institutions studied.

This study aimed to contribute to the capital markets sector, for market professionals such as independent investment agents, brokers, banks, society, companies in general that need working capital to manage their businesses.

It was shown that the Selic is important in reducing the interest rates practiced in the long term, but explains very little of the variation in the working capital interest practiced by the institutions studied.

One of the limitations of the study is that it is only for the period of 2022. During the study period, the world was coming out of a pandemic, so the market was in an abnormal operating situation.

For future work, it is recommended to carry out new studies based on a larger cut of the Selic oscillation in the interest rates practiced for working capital. It should be noted that an increase in the cost of credit for working capital loans to companies reflects the increase in the prices of products and services in the market.

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Tuberculosis in Brazil: Epidemiological aspects, diagnosis, and treatment

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Lucas Gabriel Quadros Ramos[1], Fernanda Moreira Soares Boaventura Silveira[2], Jessica Elen Martins Alves[3] and Karina Andrade de Prince[4]

ABSTRACT

Tuberculosis is an infectious disease caused by Mycobacterium tuberculosis, considering that this comorbidity represents a public health problem, it is of paramount importance to understand the associated clinical, epidemiological, and economic factors due to its high prevalence in Brazil. The objective of this study was to review the literature on the epidemiological aspects, risk factors, diagnosis, and treatment related to tuberculosis in Brazil. The bibliographic research was developed from the analysis of scientific articles, obtained from the VHL, National Library of Medicine and SCIELO databases. Tuberculosis is an infectious, chronic, granulomatous and necrotizing disease caused by the acid-fast bacillus. The most common form of presentation is pulmonary, and susceptibility to the disease is influenced by multiple factors: age, nutritional status, infection with the human immunodeficiency virus, habits and lifestyle, poor income and education, inadequate housing, population density, and fragility of systems. The best form of control is through early diagnosis. This diagnosis can be made through clinical, bacteriological, radiological and histopathological data. Sputum smear microscopy is performed using 2 to 3 samples collected in the morning in order to detect sputum smear microscopy patients. Culture in solid and/or liquid medium is used to evaluate the presence of mycobacteria and enable their identification. The standard therapy of the disease consists of the use of Rifampicin, Isoniazid Pyrazinamide and Ethambutol (RIPE) for 2 months and (IR) for 4 months. The effective implementation of prophylactic measures is essential to reduce the burden of tuberculosis in Brazil. This context highlights the need to strengthen tuberculosis control actions in all spheres of the health system, with a focus on early diagnosis, treatment adherence, and prophylaxis measures.

Keywords: Tuberculosis, Bacterial resistance, Epidemiology, Diagnosis, Treatment.

[1] Graduated in Medicine from the UNIFIPMOC University Center, Montes Claros – MG
E-mail: Lucasg2711@me.com, URL
LATTES: http://lattes.cnpq.br/0582004240693908
[2] Graduated in Medicine from the UNIFIPMOC University Center, Montes Claros – MG
Email: Fernanda_msoares2012@hotmail.com
LATTES: http://lattes.cnpq.br/2153312865929675
[3] Graduated in Medicine from the FUNORTE University Center, Montes Claros – MG
E-mail: Jessalvesm97@gmail.com
LATTES: http://lattes.cnpq.br/2483357979278750
[4] Doctor in Biosciences and Biotechnology / UNESP, Professor at the University Center UNIFIPMOC and FUNORTE, Montes Claros - MG
E-mail: karinaprince0708@gmail.com
LATTES: http://lattes.cnpq.br/1630169166583351

INTRODUCTION

Tuberculosis (TB) is an infectious, chronic, granulomatous, and necrotizing disease caused by the acid-fast bacillus (AFB) *Mycobacterium tuberculosis*, also known as Koch's bacillus. (BRAZIL, 2019).

TB continues to be an important public health problem in Brazil, with the disease presenting an incidence rate that defies control and eradication efforts. In 2020, Brazil recorded a rate of 30.7 cases per 100,000 inhabitants, placing the country among the 30 with the highest concentration of the disease in the world (BRASIL, 2021). The epidemiology of tuberculosis in Brazil is marked by regional inequalities, with the highest incidence rates observed in the North and Northeast regions (FARAH *et al*., 2020).

The diagnosis of tuberculosis is a challenge, especially in vulnerable populations. The use of diagnostic methods such as sputum smear microscopy, culture, and new molecular tests, such as the GeneXpert rapid molecular test, improves early detection, but there are still gaps to be filled in the diagnostic coverage of the disease (SILVA *et al*., 2019). In addition, co-infection with the human immunodeficiency virus (HIV) further complicates the diagnosis and, consequently, the treatment of tuberculosis, requiring integrated and multidisciplinary approaches (MACHADO *et al*., 2020).

The treatment of tuberculosis in Brazil follows the guidelines of the National Tuberculosis Control Program and involves the use of multidrug therapy for a minimum period of six months with drugs such as isoniazid, rifampicin, pyrazinamide, and ethambutol. However, adherence to treatment presents challenges, largely due to the stigma associated with the disease, side effects of medications, and the complexity of the therapeutic regimen (CARDOSO *et al*., 2021). Drug resistance, notably multidrug-resistant tuberculosis (MDR), is another growing concern that requires surveillance and new treatment strategies (CAMPOS *et al*., 2022).

Finally, tuberculosis prophylaxis, which includes BCG vaccination and prophylactic treatment in individuals at higher risk of developing the disease, is essential for controlling transmission. The effective implementation of these prophylactic measures is essential to reduce the burden of tuberculosis in Brazil (LIMA *et al*., 2019). This context highlights the need to strengthen tuberculosis control actions in all spheres of the health system, with a focus on early diagnosis, treatment adherence, and prophylaxis measures.

METHODOLOGY

This is a narrative review of the literature, with the objective of seeking updates on the epidemiological aspects, risk factors, diagnosis, and treatment related to tuberculosis in Brazil, providing information in a simplified and rapid manner. Considering the object of the study, a question guided the search process in the literature: What is the prevalence, sociodemographic and

clinical profile of patients affected by tuberculosis, and the diagnosis, treatment and prophylaxis of the disease?

To achieve the objective of the study, initially the articles referring to the topic addressed were searched in the Virtual Health Library (VHL), in the National Library of Medicine database and Scientific Electronic Library Online (SCIELO), from 2015 to 2024. For this, the following Health Sciences Descriptors (DeCS) were used: tuberculosis; epidemiology; risk factors; diagnosis; treatment. The articles were selected according to the inclusion criteria: articles published in Portuguese or English, from the last 10 years and that were within the theme. Incomplete studies that did not belong to a reliable database were excluded. Thus, 36 articles were used to prepare the research.

LITERATURE REVIEW

GENERAL ASPECTS OF TB

Tuberculosis (TB) is an infectious, chronic, granulomatous, and necrotizing disease caused by the acid-fast bacillus (AFB) *Mycobacterium tuberculosis*, also known as Koch's bacillus. (BRAZIL, 2019). The pathogen reaches the airways through the speech, cough or sneeze of the individual who has the active disease, being able to eliminate viable bacilli through aerosols (TAVARES *et al*., 2019). The most common form of presentation is pulmonary, but there are also extrapulmonary involvements. Finally, TB commonly manifests itself through a chronic course, an infectious syndrome that can generate anorexia, fever, weight loss, prostration, in addition to the symptoms of the affected site (BRASIL, 2019).

Thus, it can be stated that TB is considered a serious public health problem (MANÇANO; ZANETTI; MARCHIORI, 2022). Since 1993, the World Health Organization (WHO) has declared TB one of the world's emergencies, being a health priority that to this day remains among the top 10 causes of death from infectious diseases caused by a single agent in the world (BRASIL, 2017). In addition, important negative factors that corroborate the incidence of the disease are the appearance of multidrug-resistant strains and the co-infection of HIV-positive patients (SILVA *et al.*, 2021).

RISK FACTORS

Susceptibility to tuberculosis is influenced by multiple factors, among which the following stand out: age, nutritional status, infection with the human immunodeficiency virus (HIV), habits and lifestyle (alcoholism, smoking), poor income and education, inadequate housing and large families, population density, and fragility of the systems. In addition, it is known that individuals who are close contacts of tuberculosis patients are at high risk of developing the disease, especially in the first two years after contact and infection (SILVA *et al.* ,2018).

Taking into account the COVID-19 pandemic, tuberculosis has become a risk factor as there is a co-infection between these two diseases. Although there are few studies, analyses carried out on co-infected patients from nine different countries, mainly in Italy, concluded that there was a greater presence of these two diseases in immigrants and male patients. Another conclusion was the mortality in 10% of these co-infected patients, treated for the 2 diseases (MISHRA *et al*., 2021).

Still on the influence of the COVID-19 pandemic on the course of TB patients, researchers analyze that the simultaneity of these diseases in a patient has a high power to lead him more quickly to more severe forms of the viral disease. This is explained by the characteristic of both diseases to shake the patient's immune system. Therefore, from experience of past coronavirus outbreaks, researchers say that only severe tuberculosis should be treated in a hospital setting, and COVID-19 can promote many cases of latent PT reactivation (CRISAN-DABIJA *et al*., 2020).

PATHOGENESIS

The pathophysiology begins with the entry of the bacilli through the upper airways, reaching the alveoli, promoting the recruitment of neutrophils that are initially unable to contain the infectious process, in this way, the bacilli can multiply within their interior, to the point that they rupture and contaminate new neutrophils, at this time, new phagocytes are recruited to the site of infection, and develop an infectious focus. Therefore, the primary infection occurs at the first contact with Koch's bacillus. Thus, during this primary infection, there is great dissemination of the bacillus throughout the body in an occult way (CARDOSO *et al*., 2021; PACHECO; JACOCIUNAS, 2021).

After 2 to 10 weeks, a granulomatous focus is formed, which can be called a "primary focus" or Ghon's nodule, which will contain the bacillus in its latent form. In 90% of cases, the infection will be effectively controlled at that time, and the patient will remain asymptomatic in a state of latency. Delayed activation, or reactivation, can occur in immunosuppressive conditions or with the development of comorbidities. This reactivation of the disease in a host with pre-existing immunity generates an intense inflammatory response, with the formation of caseous granulomas and pulmonary cavitation, which is the classic form of the disease (CARDOSO *et al*., 2021).

Primary tuberculosis can be divided into three, the typical primary tuberculosis, which is more common in children between 2 and 12 years of age, who will present with a small area of pneumonitis. Progressive primary, which occurs in patients who become infected with a large number of bacilli or with depressed immune defenses, in which the primary focus will evolve to a large area of pulmonary granulomatous inflammation. And the miliary form, which is a common type in children under two years of age and not vaccinated with BCG or severely immunosuppressed, in this form the bacilli are not contained and the primary focus continues to proliferate and

disseminate bacilli in the blood, if not treated early can lead to the child's death (MASSABNI; BONINI, 2019; CARDOSO *et al*., 2021; SILVA *et al.*, 2021)

The other type of presentation of the disease is post-primary tuberculosis, which develops in patients infected for more than 3 years, with a higher incidence in adolescents and adults. This subtype can occur through two mechanisms, namely the reactivation of a latent focus after an event that weakened the immune defense or by reinfection inhalation of a new bacillary inoculum. The symptoms of tuberculosis are usually related to where the bacteria are located, and respiratory symptoms such as dry and bloody cough, chest pain when coughing, and difficulty breathing are more common (MELO *et al*., 2020; CARDOSO *et al.*, 2021)

DIAGNOSIS AND DIFFERENTIAL DIAGNOSIS

The best way to control Tuberculosis is through its early diagnosis. This diagnosis can be given through clinical, bacteriological, radiological, and histopathological data (BRASIL, 2019). Bacteriological methods include sputum smear microscopy, culture, and molecular tests. Sputum smear microscopy (AFB) is performed using 2 to 3 sputum samples collected in the morning in order to detect smear-positive patients. Culture in solid and/or liquid medium is used to evaluate the presence of mycobacteria and enable their identification. Rapid molecular tests (RMT-TB) are indicated to validate the diagnosis of new cases, as well as to evaluate rifampicin resistance (COSTA *et al.*, 2018).

The radiological approach is evaluated through chest X-ray and tomography. These methods are essential to analyze patterns related to disease presentation, evolution, and resolution by treatment. Chest X-ray (BP and left profile), which is the method of choice due to its accessibility, may present patterns such as nodules, masses, consolidation, pleural effusion, or interstitial process. CT is capable of detecting more specific alterations of tuberculosis and is usually indicated after a normal radiographic presentation (SILVA *et al.*, 2021). The histopathological method is important especially for the diffuse and extrapulmonary forms of TB, it should be considered that the histopathological lesion compatible with the diagnosis is granuloma with caseous necrosis (BRASIL, 2019).

Pulmonary tuberculosis includes some differential diagnoses, especially in cases that present with a prolonged cough, such as consumptive syndromes, pneumonia, silicosis, fungal or bacterial infections, pulmonary embolism, among others, thus requiring the use of the diagnostic methods already mentioned for its differentiation. In addition, there are: the pleural form that should include lymphomas and neoplastic effusions in its diagnosis; the lymph node form which should include lymphoproliferative diseases; the meningoencephalic form which should include bacterial, fungal

and viral diseases of the central nervous system; and the osteoarticular form that should include septic arthritis and osteomyelitis (BRASIL, 2019).

TREATMENT OF PULMONARY TUBERCULOSIS

The treatment of pulmonary tuberculosis, as in many diseases, is more effective when there is an early diagnosis. However, studies have shown that many cases of Tuberculosis are treated late due to a longer delay on the part of the patient, when it takes a long time to seek recourse. There is a delay in diagnosis and treatment, but patient delay has been shown to be the major cause of late treatment of the pulmonary form of Tuberculosis, requiring patients to be more informed about the symptoms, as well as active research (BELLO *et al*., 2019).

Recent research, aiming to optimize the treatment of TB, developed a study on the benefits of the use of an immunomodulator, Imunoxel, as an adjuvant in the standard therapy of the disease, which consists of the use of Rifampicin, Isoniazid Pyrazinamide and Ethambutol (RIPE) for 2 months and (IR) for 4 months. This immunomodulator comes from a natural compound, it was approved in Ukraine as an adjuvant in PT, as it proves to strengthen the immune system and help the host in the fight against the bacillus (KITENGE *et al*., 2021).

The post-treatment period of PT should be monitored, with a criterion of cure when there is a negative sputum smear microscopy at the end of 6 months after the treatment instituted. However, in patients with COPD, it is worth following up with them requesting chest X-rays, since after treatment, these individuals are likely to have colonization by the fungus *Aspergillus* in the tuberculosis lesion. Thus, it is of paramount importance to monitor and guide the patient to stop smoking and undergo pulmonary rehabilitation to avoid exacerbations (HSU *et al*., 2020).

The treatment of latent tuberculosis infection (LTBI) is done using isoniazid for 9 to 13 months, and for children under 10 years of age and adults over 50 years of age, rifampicin is chosen for 4 to 6 months. Studies developed in South Korea have evidenced the need for active search for LTBI for early treatment and reduction of reactivation, since there is a phenomenon of population aging, which increases the risk of reactivation of LTBI cases. In addition, they are studying the possibility of using Isoniazid in the elderly, instead of Rifampicin (KIM; KIM, 2018).

After the individual infected with tuberculosis starts treatment, it is expected that he will not be bacilliferous, that is, transmitter after 2 weeks. However, studies have been carried out and concluded that most patients who started treatment for PT remained with positive sputum cultures after this period, which is contrary to what the literature preaches. Other infectious factors, such as reduced cough frequency, should be analyzed in other studies along with the post-treatment sputum culture pattern, to better assess therapeutic efficacy, since patients undergoing treatment also tend to have a decrease in cough (CALDERWOODI *et al*., 2021).

ANTIMICROBIAL RESISTANCE

Bacterial resistance to drugs is a challenge faced in the treatment of PT, caused by the constant use of drugs, mutations of the bacteria, low adherence to treatment, among other mechanisms. Studies show that for a greater success of the treatment, in addition to improving the causes of resistance mentioned, it is necessary to have a deeper research on the mechanism of action of drugs against the bacillus, as well as their ways of evading the action of the drug. In addition, cross-resistance, synergies or antagonisms between drugs (SINGH; CHIBALE, 2021).

The treatment of multidrug-resistant LTBI cases is still poorly studied. Thus, researchers indicate that the use of Levofloxacin in these cases produces a favorable effect because it treats well and causes few adverse effects. This was demonstrated by a prospective cohort study in Micronesia with a satisfactory result with the use of this fluoroquinolone in the treatment of LTBI in 110 contacts with multidrug-resistant strains, with a success rate of 100%. Another South African study of 184 children in contact with patients with multidrug-resistant tuberculosis also had a success rate of almost 100% treating this group with levofloxacin. However, more studies with control groups are needed (FOX *et al*., 2019).

Among the cases of antimicrobial-resistant PT, there is Multidrug-Resistant Tuberculosis (MDR-TB), which does not respond to the combination of rifampicin and isoniazid, and extensively drug-resistant tuberculosis (XDR-TB), which in addition to having a characteristic equal to MDR-TB, is also resistant to the use of fluoroquinolones and second-line injectable drugs. In view of this, research shows that the growing number of drug resistance is caused by fragility in medical systems and incorrect treatment, and there should be an expansion of community-focused programs to better manage Pulmonary Tuberculosis (SEUNG *et al,* 2015**).**

MDR-TB is usually treated over an 18-month period using capreomycin, linezolid, levofloxacin, ethambutol, pyrazinamide, and terizidone. However, researchers evaluated the combination of Bedaquiline (ATP synthase inhibitor), Pretomanid and Linezolid, and obtained a favorable result in 6 months, although these drugs have many adverse effects (CONRADIE *et al*., 2020). Another study was done with the combination of Rifampentin and Moxifloxacin for 4 months, with a favorable result (DORMAN *et al*., 2021).

In addition, other studies have shown both a beneficial and harmful influence of the COVID-19 pandemic on bacterial resistance to antimicrobial drugs. This pandemic caused a greater dissemination of hygienic practices, such as the use of masks, social distancing, use of alcohol gel, among other measures, which makes it difficult for resistant pathogens to spread. On the other hand, the pandemic also brought with it difficulty in following up on infectious disease treatments, telemedicine with greater prescription of antimicrobials, and self-medication, which cause a greater chance of growth of resistant strains (RUSIC *et al*., 2021).

Considering the epidemiology of bacterial resistance of Koch's bacillus to antimicrobials, white and brown men, aged 25 to 44 years, had more MDR-TB strains in a study carried out between 2010-2017. Another group that developed more resistance to drugs were alcoholics, carriers of the HIV virus, and those who abandoned treatment. Thus, although there are many expenses to reduce multidrug-resistant strains of TP, there is still a high incidence of the disease in Brazil (DE OLIVEIRA *et al*., 2021).

PROFILEAXIA

In Brazil, TB is rooted in the social sphere, being a strong aggravating factor of the disease. Epidemiological data need control and prevention measures. In addition, the United Nations (UN) has included as a goal the elimination of Tuberculosis by the year 2030, as well as Brazil having instituted the National Plan for the End of Tuberculosis, where there is the intention to reduce the incidence and mortality coefficient by 2035 (BRASIL, 2018). For tuberculosis control, it is essential to interrupt the chain of transmission of the disease. Carriers of undiagnosed pulmonary TB have the power to infect a branch of 10 to 15 people per year, and if they get sick, they will maintain the transmission of the disease (WHO, 2021).

It is important to emphasize that the smaller the particle, the more chance it is to remain in the air, putting it at risk and having a greater possibility of being aspirated through the airways of individuals and infecting it (TEIXEIRA *et al.*, 2020). The Ministry of Health (MS) recommends that all identified contacts undergo tests and that they begin LTBI treatment, aiming to reduce the chance and risk of illness. It is important to emphasize that adherence to chemoprophylaxis is low worldwide, and that it is essential to exclude the active disease before the indication of LTBI treatment (BRASIL, 2019).

Another preventive measure in force is the BCG vaccine, recommended for application in the first month of the child's life and also provided for as secondary prevention with isoniazid, recommended for people who have direct contact and contact with someone with active TB (TEIXEIRA *et al.,* 2020). It is necessary to highlight the importance of home visits and educational actions with guidance for families in endemic areas, as well as individual guidance on the disease, and how to reduce the chances of contagion (ALENCAR *et al.*, 2019).

FINAL CONSIDERATIONS

In this discussion on tuberculosis, the importance of understanding the epidemiological aspects, diagnosis, treatment, and prophylaxis involving this disease of global relevance is emphasized. Tuberculosis continues to be a significant public health challenge, with millions of new cases diagnosed annually. Careful analysis of epidemiological data reveals not only the geographic

distribution of the disease, but also the most vulnerable populations, allowing the implementation of targeted strategies.

The diagnosis of tuberculosis has evolved considerably in recent years, with the incorporation of new technologies that provide greater precision and speed. Tools such as polymerase chain reaction (PCR) and early detection methods have been instrumental in reducing the rate of underdiagnosis and improving patient prognosis. However, the continuity and effectiveness of screening strategies in at-risk populations are crucial for the eradication of the disease.

The treatment of tuberculosis, although effective, requires a commitment from both health professionals and patients. Drug resistance is regrettably a growing concern, underlining the need for rigorous monitoring and research for the development of new drugs and therapeutic regimens. Promoting adherence to treatment and improving health education are indispensable components of the fight against tuberculosis.

Finally, cooperation between the health sectors, the scientific community, and civil society is key to building a future without tuberculosis. Investment in research and the dissemination of knowledge resulting from research should be encouraged to face this complex health problem. This chapter reinforces the need for a multidisciplinary and integrative approach to combat tuberculosis, providing an effective and sustainable response to the challenge presented by this infectious disease.

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Technical and Economic Feasibility Study of the application of anodized aluminum sheets in the solar field of Heliothermal Power Plants

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Vanderlei Affonso Martins[1], Mariana Weiss[2], Rafael Soria[3], Gaius Porziuncula[4], Ricardo Bicudo[5], Paulo Cunha[6] and Felipe Gonçalves[7]

ABSTRACT

The work analyzes the technical economic feasibility of the application of anodized aluminum sheets, instead of glass mirrors, in the solar field of parabolic cylinder heliothermal plants. The adaptation of this technology to the Brazilian case is evaluated. From the qualitative analysis of the technical specifications of the two types of reflectors, and the simulations carried out in the SAM, it is possible to conclude that systems with glass reflectors have better properties than aluminum mirrors, however, from the economic point of view, aluminum mirrors would allow to achieve economic viability for projects that operate in medium temperature ranges.

Keywords: Heliothermic, Solar concentration, Parabolic cylinder, Anodized aluminum reflector, Glass mirror reflector.

[1] Doctor in Energy Planning – PPE/COPPE/UFRJ
Institution: FGV Energia
E-mail: professor.vamartins@gmail.com
[2] Doctor in Energy Planning – PPE/COPPE/UFRJ
Institution: FGV Energia
E-mail: mariweiss@uol.com.br
[3] Doctor in Energy Planning – PPE/COPPE/UFRJ
Institution: FGV Energia
E-mail: rsoriap@usfq.edu.ec
[4] Master in Environmental Engineering – COPPE/UFRJ
Institution: FGV Energia
E-mail: cpcosta@firjan.com.br
[5] Master of Science in Engineering from the Technological Institute of Aeronautics (ITA)
Institution: FGV Energia
E-mail: rbicudo@firjan.com.br
[6] Master in Regulation of the Energy Industry from UNIFACS
Institution: FGV Energia
E-mail: paulocesar.cunha@fgv.br
[7] Master in Production Engineering - PEP/COPPE/UFRJ
Institution: FGV Energia
E-mail: felipe.goncalves@fgv.br

INTRODUCTION

Heliothermal technology is capable of generating energy in the form of heat and electricity through the transformation of direct solar irradiation (DNI). Presenting advantages over other renewable energy sources, such as wind and solar photovoltaic, solar thermal generation is flexible and capable of being dispatched (13).

Due to their ability to store energy in the form of heat, to generate electricity and process heat, including for cogeneration, and to be hybridized with several other energy sources, solar thermal plants usually have a higher capacity factor than other renewables, being able to operate on the basis with firm energy, as well as meet peak loads and demand for ancillary services at any time of the day (1); (4); (12).

As highlighted in the Brazilian Electric Sector Expansion Plan (8), alternatives have been sought to meet peak and demand fluctuations that ensure the safety and stability of the system, but that also contribute to low tariffs and the reduction of greenhouse gas emissions. Such characteristics, added to the fact that Brazil has a great potential for solar thermal generation due to the high incidence of DNI, has made solar thermal technology very attractive to the Brazilian electricity sector.

However, there are still some challenges regarding this source, especially with regard to its economic viability. According to the Renewable Cost Database study (6), CSP projects have been showing a downward trajectory of levelized energy costs. However, this technology is still significantly more expensive than other renewable sources, such as solar photovoltaic and onshore wind, and far from being considered commercial. With this objective, several countries have been seeking new concepts of solar thermal generation that make it possible to lower the cost of the production process of their components and increase their productivity.

In this context, in 2015, ANEEL held the Call for Strategic R&D Project No. 019/2015 "Development of National Technology for Heliothermal Generation of Electricity" with the objective of studying the possibility of producing components of solar thermal plants in Brazil and stimulating the scientific and technological development of this energy source in Brazil, in which the authors of the article participate.

According to data from NREL (10), the solar field was the component with the largest share (31%) in the investment cost of a CSP parabolic cylinder plant with heat storage. An alternative to lower the cost of the solar field is the replacement of borosilicate glass mirrors with anodized aluminum plates. Despite resulting in a slight drop in efficiency and lower durability due to inclement weather, the use of aluminum reflectors in solar thermal plants is significantly cheaper, less complex to produce and easier to transport.

In addition, the production of solar fields for solar thermal generation in Brazil could be a

way to promote the opening of a new market for the national aluminum industry, which has been suffering from the high price of electricity and competition with Chinese products.

Thus, this work aims to make a qualitative analysis of parameters that can impact the technical economic feasibility of the application of anodized aluminum sheets, instead of borosilicate glass mirrors, in the solar field of solar thermal plants and to evaluate the adaptation of this technology to the Brazilian case, especially for smaller installations that are also suitable for cogeneration applications in industrial processes.

REFLECTOR MATERIALS AND THEIR CONFIGURATIONS

In this topic, the theoretical references for heliothermal reflector materials and their configurations will be addressed, in order to support the methodology of the work. Collectors for solar concentration require the use of selective surfaces with high specular reflectance of the solar spectrum. Reflective metals typically used in solar reflectors are silver and aluminum, due to the good reflective properties in the spectral range of sunlight incident on Earth. The reflectance of silver is considerably higher than that of aluminum for most wavelengths (>500 nm). The solar hemispherical reflection of silvery surfaces can reach a maximum of 98% in a vacuum, while for aluminum the maximum is 92% (3).

The configurations of a solar reflector are usually based on highly bright metals or metallic coatings placed on substrates such as glass, polymers or metals. When the substrate is opaque, the reflective layer should always be the front surface, e.g. with polished aluminum. In this case, the reflector is known as the "front surface" or "first surface". These reflectors, to improve durability, can have a very thin and transparent front coating (<5 μm thick). On the other hand, if a transparent substrate (glass, methacrylate, polycarbonate) is used, the reflective coating should be on the back surface of the substrate, being known as a "second surface" reflector. Both metals require high-quality protective coatings to protect against corrosion. First surface mirrors require clear coatings on top. Second-surface reflectors always have protective coatings behind them (varnish), or are bonded to additional substrates.

The characterization made in the following is a synthesis of Chapter 3 of Heller's book (3), on materials and configurations of reflectors for solar concentration.

SECOND SURFACE REFLECTORS

Thick glass silver mirrors

It is composed of a layer of reflective silver coated on the front surface by a thick layer (3-4 mm) of monolithic glass. Given that glass can have a low content (0.02%) of Fe2O3, which absorbs a portion of solar irradiation, the type of glass used for the solar industry is called "light white" or

low-iron glass. The silver layer (with an average density of 0.8 -1.2 g/m2) is extremely vulnerable to ambient contaminants, humidity or salty atmosphere. Therefore, in addition to front protection, protection from behind is also important. This protection is achieved with one layer of copper, and two or three layers of protective coating paint that contains some lead (0.5% to 2.5% by weight).

In the process of manufacturing the mirror with thick curved glass, the flat glass is heated in furnaces over a parabolic mold; Then, the glass is silvered on the back surface. Finally, the silver surface on the back is covered with the coatings.

A high reflectance is achieved due to the intrinsic properties of silver, and may have little scattering due to the fact that glass is a very smooth substrate.

Thin glass silver mirrors

The configuration is very similar to the thick glass mirror, the main difference is the thickness of the glass layer, less than 1 mm. To obtain the shape of the collector and give the collector robustness, the reflectors are glued to the metal, polymer or composite material structures. The reflectance is even higher than the thick glass reflector because the top glass layer is thinner, and as a consequence, the optical path of the sun's rays is smaller. These reflectors are lighter and cheaper than thick glass ones, but the cost of the back frame must be added.

Silver Laminated Glass Mirrors

These reflectors use silver as a reflective layer, protected by a layer of glass on both sides, front and back, similar to the windshields in cars. The reflectance is similar to the thin glass reflector, because the front layer of glass is typically between 1 to 2 mm thick. The total thickness of the reflector is similar to that of the thick glass reflector. The shape is given during the thermal manufacturing process. The resistance and durability of this mirror are greater than the previous ones, but the production cost is higher.

FIRST SURFACE REFLECTORS

Anodized Aluminum Mirror

Depending on the top coating, various aluminum reflectors are available. The best known is built with pure aluminum deposition on a polished aluminum substrate with a layer of aluminum oxide between the two (anodized) and some clear coatings on top. For example, with a layer of alumina (SiO2), which is useful for protecting against abrasion and corrosion. Other reflectors use organic coatings or anodized aluminum as the top layer.

Aluminum reflectors are increasingly used for solar concentrating applications due to their low weight, high ductility (they withstand wind loads without damage), and flexibility in design,

construction, and assembly. The manufacturing process also allows for massive production: the coiling process. As a result, these reflectors have the potential for cost savings compared to glass mirrors.

On the other hand, in addition to the low reflectance of aluminum, the marks of the coiling process generate a rougher surface than that of glass mirrors, which leads to greater scattering of solar irradiation. The lower reflectance of aluminum compared to silver makes aluminum reflectors more appropriate for industrial process heat generation (SHIP) applications, and not as appropriate for electrical generation (CSP). In addition, the duration of these reflectors in urban, industrial and polluted environments is shorter than those of silver. To increase the duration, flat glass covers can be added to the aperture plane in small parabolic cylinders.

Silver Polymer Film Mirrors

These mirrors use a silver reflective layer protected on the front by several layers of polymers, and deposited on a substrate (usually it is also a polymer). The polymer substrate limits the temperature (60-80°C) during silver deposition. This material is lightweight and flexible, so it is easy to adapt it to the parabolic collector. The process of bonding the silver film to the substrate (glass, methacrylate, polycarbonate) must be done with great care to prevent bubbles from getting trapped, which can deflect the reflected rays.

METHODOLOGY

The comparison between the two types of solar field (glass mirror and aluminum mirror) will be made, at first, through the qualitative analysis of the technical specifications of two types of commercial parabolic cylinder collectors. Two types of parabolic cylinder manifolds were chosen (Table 1 and Figure 1):

a) large collectors with reflective surface of glass mirror, Solargenix brand, and Schott PTR-70 receiver;

b) small collectors, with anodized aluminum surface, and receiver, both from the Mexican brand Inventive Power.

In a second moment, the System Advisor Model (SAM) software was used to simulate the operation of solar concentration projects in Brazil, in Bom Jesús de Lapa – NE, using the two types of systems described above (using the properties presented in table 1).

For the second part, the simulation of projects using the two types of collectors, the System Advisor Model (SAM) software was used. SAM is a free-to-use software, developed by the National Renewable Energy Laboratory (NREL). SAM was chosen because of the versatility it presents through its module for evaluating process heat generation projects with

solar concentrators. It is noteworthy that in order to meet the objectives of the work, to analyze the technical and economic feasibility of projects with glass or aluminum mirrors, only the generation of heat in the solar field was simulated. Electrical generation was not simulated, which would be possible by harnessing the heat generated in the solar field in a power block, after heat exchange between the thermal fluid circulating through the solar field and the working fluid. Several authors have already used the SAM model for several research works in the area of CSP in Brazil, for example: in the evaluation of CSP plants hybridized with biomass in the Brazilian Northeast (14).

FIGURE 1 - Commercial parabolic cylinder manifolds.



(a) Large collectors with Solargenix glass mirror reflective surface and Schott PTR-70 receiver. (b) anodized aluminum surface collectors and receiver, Inventive Power brand.

The SAM model is able to integrate the financing, incentives, costs and performance of a solar concentration plant within a single model, enabling a consistent analysis for good decision-making, looking at both technological and financial issues (15); (9).

In addition, SAM has the ability to use a variety of climatological data in various formats (TMY3, TMY2, EPW), which gather the necessary information (DNI, wind speed and

ambient temperature) for the design of the solar field and for the calculation of the energy generated over a typical year at one-hour intervals (11).

The data presented in Table 1 were used to configure the two simulated solar concentration systems: a) large-scale, with collectors that have glass mirror reflectors, and b) small-scale, with collectors that have aluminum reflectors. The capital costs, fixed and variable O&M, presented in Table 2, were also considered.

Soria et al. (14) communicated directly with the Canadian company Naanovo Company, which expressed interest in participating in the Brazilian market to develop CSP projects. The company indicated that by using SolarMaax anodized aluminum collectors and smaller Schott receivers, and installing an assembly plant in the Northeast region, it would be possible to achieve a capital cost of 10% to 20% lower than typical designs based on glass mirror reflectors. This hypothesis is justified by technological learning at the global level in the period 2020 – 2025 (2); (5); (7), but also to the reduction of import and transport costs to the project sites.

Table 1. Comparison of the technical specifications of parabolic cylinder manifolds with glass mirror and with aluminum mirror.

General Features and Technical Specifications of Parabolic Cylinder Manifolds			**Unit**	**Large-scale projects, glass collectors**	**Small-scale projects, aluminum collectors**
General features		Temperature range - solar heat for industrial processes	°C	90-260	45-130
		Lifespan	Years	40	>20
Collector	Collector geometry	Collector		Solargenix SGX-1	Inventive Power - PT 110 ®
		Reflective surface		Glass mirror	Anodized aluminum - reflective blade ALANOD Miro Sun
		Reflective surface opening area	m2	470,3	3,09
		Full width of reflective surface with structure	m	5	1,21
		Length of a collector	m	8,33	3,05
		Average distance between reflective surface and focus	m	1,8	0,341
		Average Pipe Distance Between Assemblies	m	1	1
	Optical Parameters	Tracking error		0,994	0,988
		Geometry Effects		0,98	0,952
		Reflective surface reflectance		0,935	0,90
		Reflective surface dirt		0,97	0,97
		General optical error		0,99	1
	Optical collector calculations	IAM on the summer solstice		1,00361	0,999903
		Final loss on the summer solstice		0,999752	0,994658
		Optical efficiency in design		0,874643	0,821123
Receptor	Receiver geometry	Receptor		Schott PTR70	Inventive Power -PT 110
		Inner diameter of absorber tube	m	0,066	0,030

		Outer diameter of the absorber tube	m	0,07	0,033
		Inner diameter of glass envelope	m	0,115	0,0656
		Outer diameter of glass envelope	m	0,125	0,07
		Material Type of Glass Envelope		Borossilicate	Borossilicate
		Absorber flow plug diameter	m	0	0
		Roughness of the inner surface		4,5*10^-5	4,5*10^-5
		Type of absorbent material		AISI 304L	AISI 304
	Receiver: parameters and variations	Absorber absorption, selectively coated		0,96	0.87 (Solkote coating)
		Absorber emittance, with selective coating		0,095	0.35 (Solkote coating)
		Glass envelope emittance		0,86	0,85
		Transmittance of glass envelope		0,97	0,92
		Glass coating		Anti-reflective	n.a.
	Receptor:	Optical reduction		0,869751	0,733407
	Total weighted losses	Heat loss at the design point	W/m	190	n.a.

Source: prepared by the authors from (13), (14) and (15).

Table 2. Capital costs, fixed and variable O&M costs, for simulated systems.

Material	**Cost of capital (USD/kW-t)**	**O&M fixo (USD/kW)**	**Variable O&M (USD/kWh-t)**
With glass mirror	560	8	0,001
With anodized aluminum	500-400	7	0,001

Source: prepared by the authors from (13), (14) and (15).

Table 3. Results for comparison between glass and aluminum mirror.

Material	**Average Efficiency (%)**	**Surface-to-installed power ratio (Wt/m2)**	**Reduction in LCOH**	**Local content in the project (%)**
With glass mirror	61	150	Reference	Medium
With anodized aluminum	48	90	7% to 12%	High

Source: prepared by the authors from (13), (14) and (15).

The System Advisor Model (SAM) integrates financing, incentives, costs and performance of a solar concentration plant into a single model, allowing for consistent analysis for decision making, addressing both technological and financial aspects.

In addition, SAM can use various climatological data in various formats (TMY3, TMY2, EPW), which include essential information such as DNI, wind speed and ambient temperature. This data is crucial for solar field design and for calculating the energy generated over the course of a typical year at hourly intervals.

Thus, the data in Table 1 were used to set up two simulated solar concentration systems on glass and anodized aluminum mirror reflectors. Capital costs and fixed and variable O&M were also

considered, as shown in Table 2. And from these constructions, it was possible to establish project comparisons between the two technologies.

RESULTS AND DISCUSSIONS

From the qualitative analysis of the technical specifications of the two types of reflectors, and from the simulations carried out at SAM, it is evident that systems with glass reflectors have better properties than aluminum mirrors. However, from the economic point of view, aluminum mirrors would allow economic viability to be achieved in some projects, as shown in Table 3.

The glass mirror due to better reflectance, lower optical error, better optical efficiency, larger size of each collector unit and longer life time, is suitable for large-scale projects of high-temperature industrial process electric or heat generation (90 – 260°C). On the other hand, glass mirror collectors have a higher cost of capital, which makes it difficult to access financing, as well as the expense of interest payments will be higher, and finally, leads to a more expensive final energy. Thus, it is recommended to use this technology for large projects that demand higher working temperatures, and where the value of the land is high and it makes sense to install high-efficiency systems, given that these require a smaller installed area to generate the same amount of energy.

Glass mirror collectors also have a longer service life. Much research, however, has focused on techniques to improve the design and technical characteristics of aluminum reflectors. For example, the development of more sophisticated coatings for aluminum would make it possible to extend the life of the system.

Given that they have a smaller solar capture surface and consequently greater modularity, projects that consider aluminum mirrors are appropriate for smaller projects that operate in an average temperature range (45–130°C), being ideal for heat generation for industrial processes, for example.

On the other hand, systems with aluminum mirrors need a larger capture area per unit of installed capacity to compensate for their lower optical and energy conversion efficiency. However, despite their lower efficiency, due to the low capital cost, the levelized cost of heat in designs based on aluminum reflectors tends to be 7 to 12% lower compared to designs that use glass mirrors (Table 3).

It is worth remembering, however, that this difference in levelized cost can be changed if financing is considered for the project. Due to the lower capital cost of solar thermal plants with aluminum mirrors, they have easy access to financing lines. Plants with aluminum mirrors, due to their size, can be adapted to strategic financing lines with more attractive rates.

In the simulated case, the lower efficiency of the collector with an aluminum reflective surface must also be explained by the thermal properties of the receiver: lower absorptivity of the

receiving tube, lower transmittance of the glass envelope, lower optical efficiency, etc.

CONCLUSION

The qualitative and quantitative analysis of the technical specifications of the parabolic cylinder manifolds with glass and aluminum reflectors, complemented by the simulations in the System Advisor Model (SAM), revealed important insights into the technical and economic feasibility of each system. Glass reflectors stand out for their better optical properties, lower optical error, greater efficiency and durability, being more suitable for large projects that demand high operating temperatures. In contrast, aluminum reflectors, despite having lower efficiency and greater need for catchment area, are economically viable in certain projects due to the lower cost of capital.

Glass collectors, with their high reflectance and optical efficiency, are ideal for large-scale projects aimed at generating electricity or heat from high-temperature industrial process (90 – 260°C). However, the high cost of capital and the difficulties associated with financing make these systems less affordable, increasing the final cost of the energy generated. The longer life of glass collectors also justifies their use in projects where durability and long-term efficiency are crucial.

On the other hand, aluminum collectors, with lower initial costs and greater modularity, are more suitable for smaller, medium-temperature (45 – 130°C) projects, such as heat generation for industrial processes. Despite its lower efficiency, the levelized cost of heat in designs with aluminum reflectors tends to be 7 to 12% lower compared to designs with glass mirrors. This factor, combined with easier access to financing lines due to the lower cost of capital, makes aluminum collectors an attractive option for certain projects.

The lower efficiency of aluminum collectors can be attributed not only to their optical characteristics, but also to the thermal properties of the receiver, such as lower absorbency of the receiving tube and lower transmittance of the glass envelope. This underscores the need for improvements in the design and technology of these systems to increase their competitiveness.

As a recommendation for future studies, investments in various parts and components of the solar thermal plant can be cited. As an example, the following developments can be cited:

- Advanced Coatings for Aluminum Reflectors, in which research should focus on the development of coatings that increase the durability and efficiency of aluminum reflectors, enabling greater competitiveness against glass mirrors.
- Thermal Receiver Optimization: Improvements in the thermal properties of the receivers, such as increased absorptivity and transmittance, can increase the overall efficiency of aluminum reflector systems.
- Cost-Benefit Analysis with Different Financing Scenarios: Studying the impact of different financing conditions on the economic viability of projects can provide valuable

insights for investors and policymakers.

Thus, investment in research and development is encouraged through real case studies, with the implementation and monitoring of pilot projects, using both types of collectors, which can provide essential empirical data to validate the theoretical and simulation conclusions of this work.

In this way, it is expected not only to enhance existing technology but also to expand the efficient use of concentrated solar energy in different contexts and scales, thus contributing to global energy sustainability.

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Comparative analysis of the main disasters that occurred in the years 1988 to 2022 related to mass landslides in the municipality of Petrópolis in Rio de Janeiro, considering human, physical and environmental aspects

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Luiz Emílo Vianna[1], Alexandre Luís Belchior dos Santos[2] and Angélica Pires Belchior dos Santos[3]

ABSTRACT

This article was prepared from the master's thesis in civil protection and defense of the Fluminense Federal University, involving the context of mass landslide disasters in the municipality of Petrópolis, in the Mountain Region of the state of Rio de Janeiro. The period under analysis of the events was the one constant from the years 1988 to 2022. A comparative analysis was carried out between indicators and relevant points of human, physical and environmental aspects among the main disasters of the period. Then, the recurrence and common points of landslide disasters in the municipality were identified to improve the efficiency of mitigating measures and assist civil defense managers in their actions. Information was also gathered that characterizes the geological formation, topography, climate and meteorological conditions, natural conditions that make the municipality vulnerable to disasters involving landslides. The study allowed preliminary results to be reached that point to a cycle of disasters, comprised in the rainiest period in the municipality, with high rainfall. The neighborhoods of Quitandinha and Morin were identified with the highest recurrence of landslides and the climatic and geophysical vulnerability faced by the municipality. In the work, the term mega-disaster was also characterized.

Keywords: Disasters, Megadisaster, Landslides, Climate vulnerability.

[1] Master's student at the Fluminense Federal University (UFF).
[2] Prof. Dr. of the Fluminense Federal University (UFF);
[3] Master in Defense and Civil Security from the Fluminense Federal University, Advisor to the Assistance Program in the Social Service of Commerce – SESC/GO.

INTRODUCTION

This article is based on the final work of the course related to the research carried out in the municipality of Petrópolis in Rio de Janeiro, related to the disasters of mass landslides that occurred in the period from 1988 to 2022, according to Vianna (2024).

The work has as its starting point parameters to be observed in the disasters of the period, which were identified and standardized by relevance, which served to identify the data collected from each disaster. The parameters were: number of dead and injured, number of affected, number of displaced and homeless, affected neighborhoods, rainfall indexes, general information on landslides, emergency spending by the public sector and affected housing units.

These parameters were analyzed and compared by year of occurrences. And the result of the comparisons of the data collected are outlined and systematized according to the occurrences in the municipality of Petrópolis in the period from 1988 to 2022.

PROBLEM

What are the relevant relationships between disasters involving mass landslides in the municipality of Petrópolis, in the time frame from 1988 to 2022? .

OBJECTIVE

To promote a comparative analysis of landslide-related disasters in the municipality of Petrópolis – RJ, highlighting the human, physical and environmental aspects that contribute to the understanding of these events.

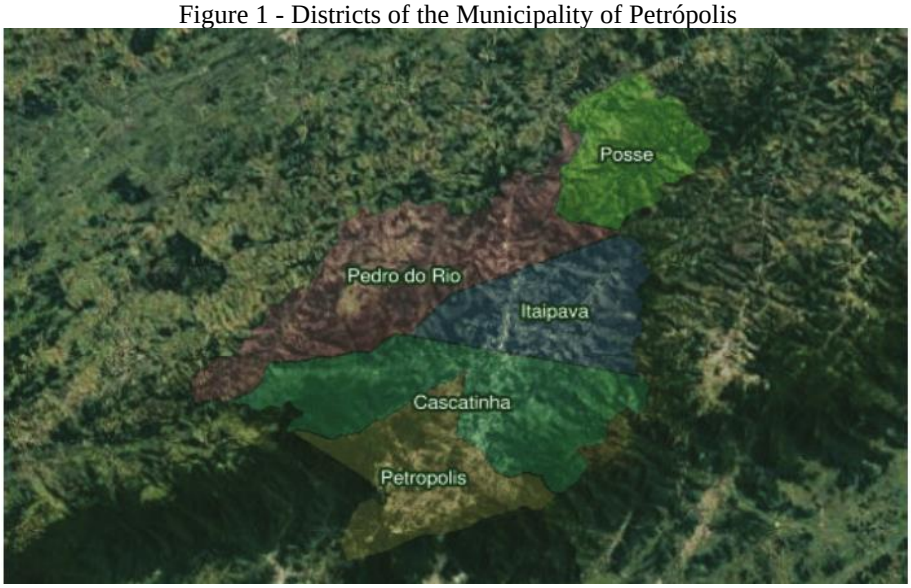
DEVELOPMENT

THE MUNICIPALITY OF PETRÓPOLIS AND CLIMATE CHANGE

The municipality of Petrópolis is located in the state of Rio de Janeiro and southeastern Brazil. It belongs to the Metropolitan Mesoregion, according to the edition of Complementary Law 184, of December 27, 2018, of the Government of the State of Rio de Janeiro (Rio de Janeiro, 2018).

The municipality is currently dismembered, according to State Law No. 1255, of December 15, 1987, of the Legislative Assembly of the State of Rio de Janeiro, into 5 districts: 1st District of Petrópolis, 2nd District of Cascatinha, 3rd District of Itaipava, 4th District of Pedro do Rio and 5th District of Posse, as shown in figure 1.

Figure 1 - Districts of the Municipality of Petrópolis



Source: Adapted from Vianna (2024).

The population of Petrópolis is 278,881 people and its territorial area is 791,144 km², according to the 2022 demographic census carried out by the IBGE and demographic density of 352.50 inhabitants per square kilometer (IBGE, 2022). The municipality belongs to the Serrana microregion of the state of Rio de Janeiro.

The municipality is 838 meters above sea level (IBGE, 2022). Its relief belongs to the Serra do Mar. According to the study by Guerra (2007) the rocks of the region are predominantly of crystalline complex, with granites, gneisses and migmatites and still present relief with great altimetric differences and steep escarpments.

Also, according to Guerra (2007) the municipality occupies a mountainous area, structured on very faulty and fractured rocks, slopes with high slopes and, at some points, soils with very deep profiles, having parts of the municipality with annual rainfall totals above 2,000 millimeters, with rainfall concentrated in the months from November to March.

According to the Chico Mendes Institute for Conservation and Biodiversity (ICMBIO, 2007), it points out that the municipality has a large Environmental Protection Area (APA-Petrópolis). In addition to this, the Serra dos Órgãos National Park and the Tinguá Biological Reserve are also part of the area. ICMBIO (2007) indicates that the surface reliefs are of the mountainous type and the steep and have high levels of rainfall and Gleisols located in fluvial plains that serve as channels for runoff from the hydrographic basins.

According to ICMBIO (2007), the main hydrographic basins of Petrópolis are the Paraíba do Sul Bay and the Guanabara Bay. Several drainage channels are formed, due to the slope, these channels become temporary rivers, due to the rains, with a large volume of water. During the rainy summer, the volume of water is formed rapidly, producing the phenomenon called "headwater" or "waterspout", which drags all kinds of material in front of it. The incidence of heavy rains in the

region can be due to the low clouds, loaded with rain, which cannot cross the summits of the mountains and clash and precipitate. Due to the steep unevenness of the slopes, the water descends at great speed, reaching the foot of the mountain with great force.

In addition to the geographical and geological characteristics of the municipality, it is observed that climate change may be related to the increase in the frequency and intensity of events that unfold disasters.

According to the Intergovernmental Panel on Climate Change - IPCC (2021), translated by the Government of Brazil, climate change is a transformation that occurs in the long term and alters temperature and climate patterns on Earth. But since the 1800s, human activities have been the main driver of climate change, contributing to the acceleration of change.

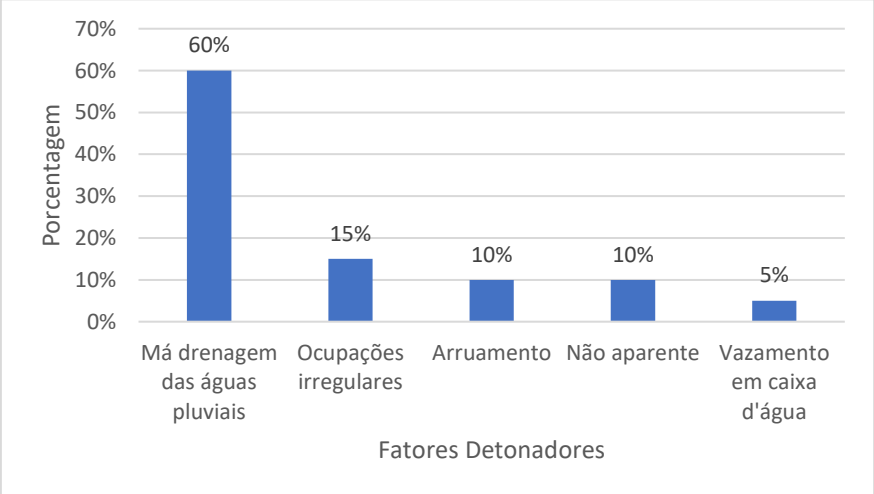
Based on this set of information and considering the characterization of the relief of the municipality, the concentration of irregular subnormal housing, the urban infrastructure, the improper use and occupation of the land and the lack of urban public planning, combined with intense rains and storms that occur very frequently in Petrópolis, fatalities occur throughout the municipal territory, in addition to material damage that impacts both the private and public sectors (Vianna, 2024).

LANDSLIDES IN THE MUNICIPALITY OF PETRÓPOLIS

Tominaga (2007) points out, in a generic way, that landslides can be understood as a series of occurrences related to the movement of soils, rocks and organic material.

Oliveira (2001), in a study on the disaster in the municipality of Petrópolis, pointed out the main agents that culminated in landslides, according to graph 1. As a result, 60% are in relation to the lack of drainage systems, often caused by irregular occupations, lack of gutters, rainwater and sewer systems, cesspools without drainage, among others.

Graph 1 - Percentage of landslide triggering factors, 2001.



Source: Adapted from Vianna (2024).

The Brazilian Atlas of Natural Disasters (CEPED, 2013) points out that the triggering factors of mass movements are directly associated with external agents, contributing to increase internal stresses.

METHODOLOGY

According to Vianna (2024), the quantitative data were collected and had the following official databases as a source of information: Brazilian Atlas of Natural Disasters from 1991 to 2012 of the University Center for Studies and Research on Disasters - CEPED, of the Federal University of Santa Catarina; the Brazilian Institute of Geography and Statistics - IBGE; the Interactive Map of the Observational Network for Natural Disaster Risk Monitoring of the National Center for Monitoring and Warning of Natural Disasters; the database of Deaths from Landslides in Brazil, 1988 to 2022, provided by the Institute of Technological Research of São Paulo - IPT; the World Bank portal, International Charter Space and Major Disasters.

The database of the municipality of Petrópolis, the Master Plan of the City of Petrópolis, the Municipal Plan for Risk Reduction – PMRR of Petrópolis of the year 2017; the portal of the Ministry of Agriculture and Livestock, through INMET (National Institute of Meteorology); and the portal of the Geological Service of Brazil - CPRM.

The work also gathered data from scientific articles, magazines, municipal and federal laws, whose indicators were assessed based on the use of comparative analysis between disasters that occurred in the period from 1988 to 2022, as follows.

DISASTERS THAT OCCURRED IN PETRÓPOLIS IN 1988

Heavy rains hit the municipality, in February 1988, 134 people died in the municipality of Petrópolis, according to Fernandes (2021). Heavy rains caused disasters throughout the territory, among the disasters were flash floods, floods, landslides, and house collapses.

According to a report by Jornal Nacional (2022), a landslide buried about nine residences on Casimiro de Abreu street, downtown, there were 40 deaths on that street alone.

According to the newspaper Diário de Petrópolis (Fernandes, 2021) the tragedy affected different parts of the city, from irregular occupations to luxury housing. The scene was one of destruction and mourning: missing people, hundreds of homeless, bodies found and unidentified.

Wernke (2021, apud Veja Magazine, 1988) points to 200 fatalities, more than 600 injured, 1000 homeless and 4000 homeless, the mayor of the city at the time reported that the rain forecast for one year, fell in just one week. At the time, the mayor decreed a state of public calamity throughout the municipality.

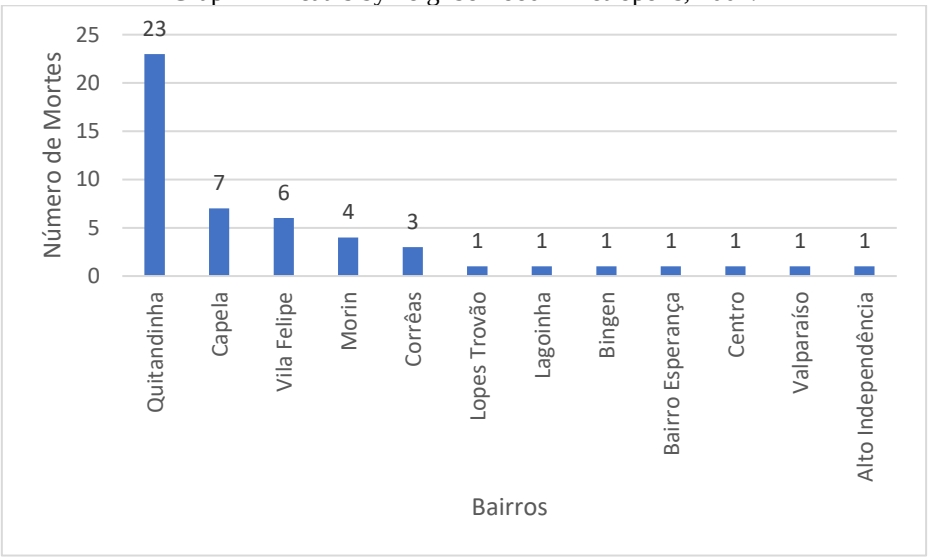
For the disaster of 1988 there are few records, the main sources of data were reports and

magazines, the EM-DAT database was consulted, which also presented divergent records.

DISASTERS THAT OCCURRED IN PETRÓPOLIS IN 2001

Heavy rains hit the municipality between February 23 and 24. 190 millimeters of rainfall were recorded in 12 hours, while in the entire month of January it recorded 179.54 millimeters, in the same year, according to Oliveira (2001). It also points out that the heavy rains were the cause of hundreds of landslides, mainly in the first and second districts of the city. It concludes that the main factors that originated the mass movements of that year were deforestation, occupations in areas without sanitation infrastructure, and with slopes greater than 45 degrees. Graph 2 points to the neighborhoods with the highest number of deaths in Petrópolis in 2001.

Graph 2 - Deaths by neighborhood in Petrópolis, 2001.



Source: Adapted from Vianna (2024).

The EM-DAT database points to the number of 50 deaths. Oliveira (2001) that had deaths in 12 neighborhoods of the city, only in the Quitandinha neighborhood, 23 deaths were identified. Due to the tragedy, a state of public calamity was declared in the municipality.

According to Soares (2001), the then president of the republic also pointed out the lack of desilting of rivers and canals in the region, an attribution of the state government. The report points out that several parts of the city landslides occurred, and the most affected neighborhoods were Valparaíso, Quitandinha, Bigen and Alto da Serra, where landslides caused deaths.

DISASTERS THAT OCCURRED IN PETRÓPOLIS IN 2011

Heavy rains hit the municipality of Petrópolis on January 11 and 12, 2011. Petrópolis has declared a state of public calamity.

According to Amaral and Lima (2011), the event occurred due to air masses coming from the South Atlantic Convergence Zone in the Mountain Region of Rio de Janeiro, combined with previous rainfall and fluvial and rainwater erosion, which culminated in landslides and floods in the region, and associated with the irregular use of land occupation resulted, in what is considered, the worst disaster ever recorded in the region.

According to Busch and Amorim (2011), several regions of the municipality of Petrópolis had records of mud and floods, several houses were affected and people were buried. Bridges, roads and streets were damaged, it also affected the geography of the city, where rivers and canals changed course. It also points out that the records of those affected (until March 23) were 905 dead, 345 missing, 34,600 homeless or displaced people throughout the mountainous region.

The World Bank (2011) classified the event as the worst disaster recorded in the history of Brazil. According to the Disaster Information Form (FIDE) of the National System of Civil Protection and Defense (SINPDEC), 74 deaths, about 25 injured, 6,956 displaced, 187 homeless and about 7,269 affected were recorded in the municipality of Petrópolis.

Those affected in the municipality of Petrópolis were mainly concentrated in the Cuiabá Valley and region. Vale do Cuiabá is a region of Itaipava, 3rd district of Petrópolis, which borders another municipality, Teresópolis. The neighborhood is about 40 km away from the center of Petrópolis. The heavy rains began on the night of January 11, which entered the early morning of the 12th.

According to a publication in the newspaper Diário de Petrópolis, on January 11, 2011, a flood of mud and water, caused by heavy rain and landslides, linked to the overflow of the Santo Antônio River, destroyed houses, dragged cars and caused floods, without distinguishing areas, social classes and people by age groups. The region had not experienced a similar tragedy since 1988. Melo (*et al*, 2011) points out that the most affected area of Petrópolis was the region in the Cuiabá River Basin, on the Santo Antônio River, with block races in the upper and middle courses and generalized flooding in the lower course of the river, and also counted in the area, 80 disappeared, for which, in 2015, there is still no solution

In its annual report on disasters, the National Center for Risk and Disaster Management - CENAD (2022) states that the tragedy was not worse only because the landslides did not affect the areas with the highest population density in Petrópolis.

According to information from the DRM-RJ (Department of Mineral Resources of Rio de Janeiro), the entry of air masses from the South Atlantic Convergence Zone (SACZ) in the Mountain Region of Rio de Janeiro, associated with the irregular use of land occupation, as well as previous rains and river and rainfall erosion, culminated in landslides and floods in the municipality of Petrópolis.

The Department of Mineral Resources of the State of Rio de Janeiro (DRM-RJ) prepared a geological report after the disaster, entitled "Serra Megadisaster". The report said the land avalanches reached 180 km/h, and moved 1 km in 20 seconds. The region was left without electricity, drinking water and communications of any kind. Public buildings and hospitals were damaged. Rescuers operate without the use of cell phones, satellites or radios. Bataglin (2014) points out that atmospheric instability resulted in heavy rains, and consequently in floods and landslides that hit rural and urban areas, some becoming totally isolated, destroying buildings and homes, public infrastructure, bridges were destroyed and the main access roads were totally or partially affected, health facilities and schools, mainly compromising water supply services, electricity and fixed telephony. Economic activities in the region were also affected, such as industries, livestock, agriculture and commerce (Freitas, 2012).

DISASTERS THAT OCCURRED IN PETRÓPOLIS IN 2013

Heavy rainfall devastated the municipality of Petrópolis on March 17, 2013. According to a study by the Department of Mineral Resources (DRM-RJ), the precipitation was marked by the joint action of the South Atlantic Convergence Zone and a cold front from the Southwest, causing heavy rains, with high rainfall, and thus saturating the soil layer leading to the occurrence of widespread landslides, flash floods, floods and several flooding points in the municipality.

The 30 days prior to the disasters kept the accumulated rainfall below average, with the accumulated rainfall below 270 millimeters.

On March 17 and 18, the Quitandinha Station recorded the highest accumulation in 24 hours with 459.5 millimeters of rain, according to table 1 (Simão, 2013).

Table 1 - Rainfall recorded on March 17 and 18, 2013

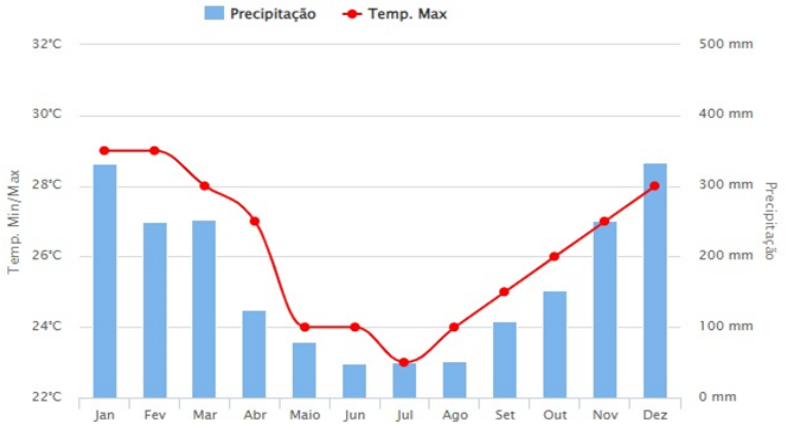
Season	24h aculates	Maximum Accumulated in 1h
Quitandinha	459,5	71,5
LNCC	405	64,25
Morin	409	42,25
Cel. Veiga	409,5	41
Bingen	337,5	35,25
Independência	355,75	66,25
Barão do Rio Branco	204,25	22
Alto da Serra	325	39,5

Source: Adapted from Vianna (2024).

The first record of rain in the municipality began at 3 pm on 03/17 and went until the early hours of March 19/03. The record of the highest rainfall occurred between 11:30 pm on 03/17, until 01 am on 03/18.

The accumulated rainfall record is equivalent from 3 pm on 03/17 to 3 pm on 03/18. Compared to the expected accumulated for the entire month of March, it is 253 millimeters, according to graph 3 Climatempo (2023), adapted from Vianna (2024).

Graph 3 - Rainfall indices and average temperatures of the municipality of Petrópolis.



Source: Adapted from Vianna (2024).

After a period with below-average rainfall, on 03/17, heavy rains hit the municipality of Petrópolis. The heavy rains originated with the influence of the heavy clouds of the Humidity Convergence Zone, which channeled a lot of moisture between the Midwest and Southeast of Brazil, and its addition to the action of humid winds coming from the ocean, a heavy rain began at night in the municipality of Petrópolis and a maximum alert for flooding of the Quitandinha River was decreed, and in Silva Jardim (at 11:00 pm, 26.4mm/h). Specifically for Petrópolis and the foot of the Serra, the Meteorology System of the state of Rio de Janeiro – SIMERJ, issued several notices of registration of significant accumulation.

These extreme rains initiated the outbreak of widespread landslides in the municipality (Department of Mineral Resources – DRM-RJ).

The most significant part of landslides reached slopes excavated upstream or downstream of houses and roads, without drainage. In most of the affected sectors, the processes began as violent erosions involving only soil, and evolved, from the deep incision of the scars, to landslides of the slopes of the ravines. Some movements reached drainage lines or amphitheaters on the slopes, occurring in the form of rubble, garbage and soil runs (sometimes rocky blocks), generated from the concentration of surface water. The natural slopes were little affected (Department of Mineral Resources – DRM-RJ).

According to the presentation of the then Secretary of Civil Defense of the municipality, Lieutenant Colonel of the Military Fire Department of Rio de Janeiro Rafael J. Simão (04/14/2013), there were more than 2,200 occurrences registered by the Civil Defense of Petrópolis, about 70% of these occurrences were landslides. The Civil Defense carried out about 2,100 inspections and

interdicted 712 houses and 662 houses were partially destroyed and 213 were completely destroyed. In addition, some health care points were affected, hindering the care of those affected and injured. As of March 25, 34 dead, 49 injured, 1085 homeless, 1,658 displaced and 150,000 people affected have been recorded.

The landslides affected several locations in the municipality, with the first district being the most affected, in the neighborhoods: Quitandinha (337 occurrences); Castrioto, Chácara Flora; Showers; Duarte da Silveira, Independência (132 occurrences); Siméria; São Sebastião (156 occurrences); Castelanea Sargento Boening (93 occurrences); Alto da Serra (215 occurrences); Meio da Serra; Caxambu; Moselle; Bamboo; Vila Felipe; Morin, Quarteirão Brasileiro, Centro (52 occurrences), 24 de Maio, 1° de Maio, Valparaíso (32 occurrences), Coronel Veiga, Bingen (80 occurrences), Quarteirão Ingelhein, Barão do Rio Branco, Floresta, Cremerie, Fazenda Inglesa, Bataillhard, Provisória, Retiro, Roseiral, Saldanha Marinho and Vila Militar. In the second district are the neighborhoods of Estrada da Saudade, Correias, Carangola, Quissamã, Itamarati, Araras, Cascatinha, Bonsucesso, Nogueiras, Samambaia and Sertão do Carangola. In the third district, Itaipava. And in the fourth district, the Pedro do Rio neighborhood (Database provided by the Office of the Comptroller General of the Union, protocol 59009.000888/2023).

According to the Department of Mineral Resources of the state of Rio de Janeiro (DRM-RJ, 2013), the month of March 2013 presented accumulated precipitation above the monthly average, mainly due to the junction of the cold fronts of the Southwest with the zones of convergence of humidity of the Northwest, resulting in a disaster of great proportions, resulting in 34 deaths and more than 100 landslides. The report points out that due to the heavy rainfall, the disaster could have been more catastrophic, due to the dry period before the event, which caused the month to start with accumulated rainfall values below average, which can be considered the main reason why the extreme rains of the seventeenth and eighteenth of March did not generate a destructive picture similar to that of the 2011 disaster in the Serra Fluminense.

DISASTERS THAT OCCURRED IN PETRÓPOLIS IN 2022

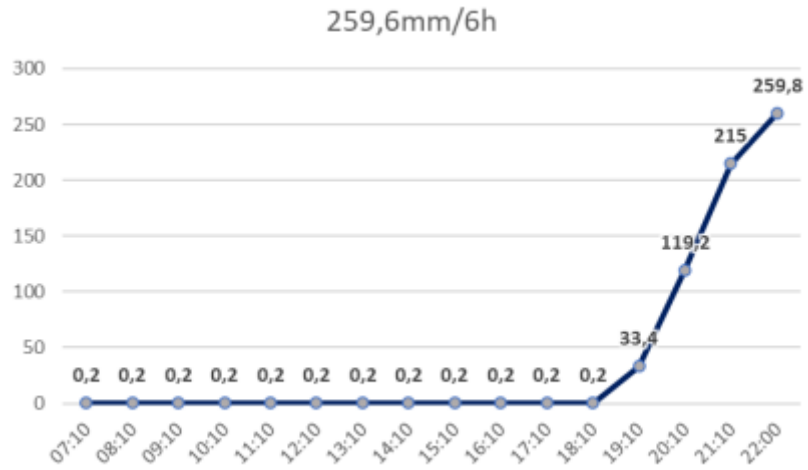
According to a report by the Department of Mineral Resources of the state of Rio de Janeiro (DRM-RJ, 2022), two major disasters were recorded that hit the municipality of Petrópolis, 35 days apart. The first, which took place on February 15, was about six hours of heavy rain, with about 260 mm of rain in the first two hours and left 234 dead, and the second event, also of heavy rain, was recorded on March 20 and left 7 dead, totaling 241 victims of disasters in the year.

Also according to DRM-RJ (2022), the State Center for Monitoring and Alerts of Natural Disasters of the State of Rio de Janeiro (CEMADEN-RJ), announced the arrival of a cold front and the pre-frontal thermodynamic effect that caused the occurrence of heavy to occasionally very heavy

rains over the municipality. The storm started around 4:30 pm, during peak congestion hours in the city, leaving the mobilization and movement of emergency and rescue vehicles impaired and difficult, and allied to this, several flooding points were recorded. The city was left without electricity and lost communications, even via cell phone, leaving a true scenario of chaos and destruction.

On February 15, the rainfall station of São Sebastião, monitored by CEMADEN, recorded 260 mm of accumulated rainfall in six hours, and 215 mm for the first three hours as shown in graph 4 (DRM-RJ, 2022). The Alto da Serra rainfall station, monitored by the State Institute of Environment (INEA), recorded 233 mm of accumulated precipitation in four hours (DRM-RJ, 2022).

Graph 4 - Accumulated rainfall per hour, in millimeters, recorded at São Sebastião station on February 15, 2022.



Source: Adapted from Vianna (2024).

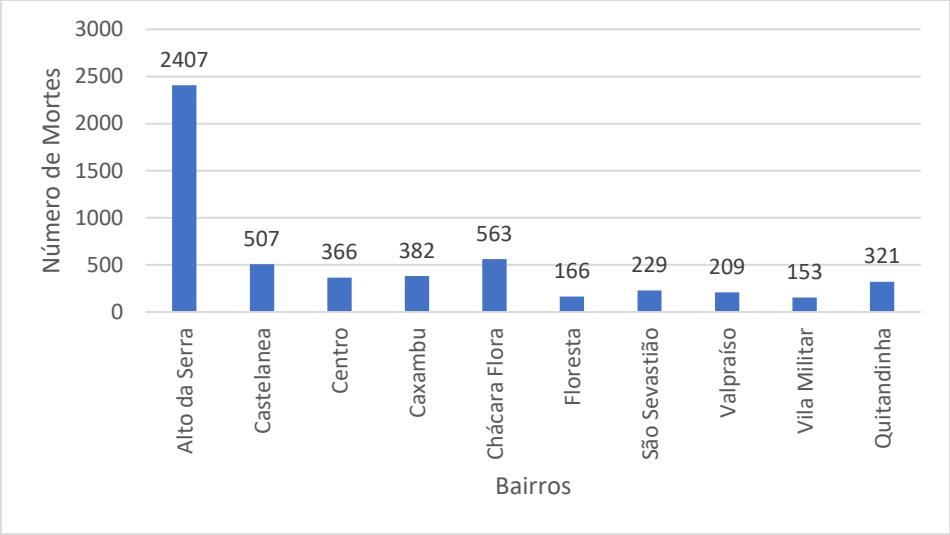
Hundreds of landslides were triggered on the slopes of the 1st District, mostly between 5 pm and 9 pm, while the city's watersheds suffered flooding processes. The region of the 1st District recorded the highest rainfall rates in the city.

Also according to the DRM-RJ (2022), the rescue and rescue actions began during the night of February 15 and were conducted by the battalion of the Petrópolis Fire Department. There were hundreds of people buried, injured and hospitalized, 6014 occurrences were registered, the number of homeless and displaced people accounted for about 3500 people, at first, the main and secondary roads, in different parts of the city, were obstructed with materials from landslides and floods, making it difficult for the Fire Department to act. Basic services to serve the population such as electricity, water, telephone and hospitals were also affected.

The high rainfall caused a rapid saturation of the surface layer of soil existing on the slopes, causing mass movements of large proportions that affected entire communities. The most affected areas of the city were the region of the 1st District, in the neighborhoods of Alto da Serra (2407 occurrences), Castelanea (507 occurrences), Centro (366 occurrences), Caxambu (382 occurrences),

Chácara Flora (563 occurrences), Floresta (166 occurrences), São Sebastião (229 occurrences), Valparaíso (209 occurrences), Vila Militar (153 occurrences) and Quitandinha (321 occurrences), according to the data presented in graph 5, according to Blaudt, Alvarenga and Garin (2023), adapted from Vianna (2024).

Graph 5 - Occurrences registered between February 15 and March 19, 2022, in the most affected neighborhoods.



Source: Adapted from Vianna (2024).

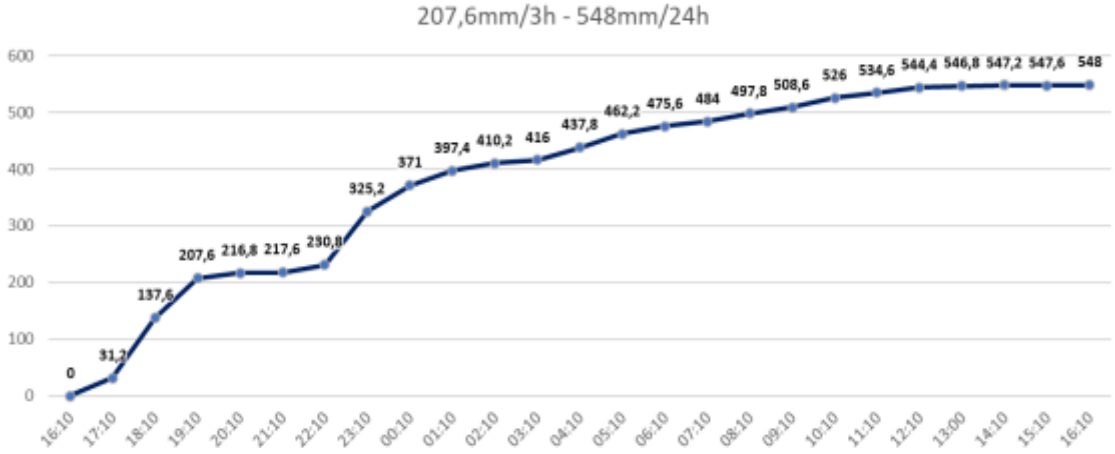
According to the authors Blaudt *et al.* (2023) 6,293 occurrences were recorded by the Municipal Civil Defense Secretariat of Petrópolis, between February 15 and March 19. Of the total, 5,394 occurrences were of properties affected by landslides or at risk of being affected, making the occurrence more frequent in the period, totaling 86%. The municipality's Civil Defense carried out 4,755 interdictions, 2,407 of which were in the Alto da Serra neighborhood alone.

Blaudt *et al.* (2023) point out that the Alto da Serra neighborhood was the most affected by the mass movement, more specifically in the locality popularly known as Morro da Oficina. The high volume of rain led to a rapid saturation of the soil layer, which slid and reached extensive talus deposits existing in the lower two-thirds of the slope. The region of the talus deposit is also the location of the buildings, this heterogeneous material was added to the mass movement, causing the displacement of rock blocks of various sizes, the complete destruction of about 90 properties and the loss of approximately 80 lives. Also according to the authors, the rescue and rescue operations, from the rains of February 15, were ended with 234 deaths among victims of landslides and drownings, of which 93 were recorded only in Morro da Oficina.

In view of the magnitude and need for specialized technical support and response infrastructure, the Municipality declared, on February 15, a state of public calamity, through Decree No. 033/2022.

On March 20, after 35 days of heavy rains on February 15, a Sunday, the Municipality of Petrópolis was again hit by heavy rains, due to the passage of a cold front over the city, culminating in new generalized mass movements in the region of the 1st District. According to the DRM-RJ report (2022), graph 6 of the DRM-RJ, (2022) the São Sebastião rainfall station, monitored by CEMADEN, had records of 207.6 mm of accumulated rainfall in three hours and about 548 mm in 24 hours.

Graph 6 - Accumulated rainfall per hour, in millimeters, recorded at São Sebastião station between March 20 and 21, 2022.



Source: Adapted from Vianna (2024).

According to the DRM-RJ report (2022), the São Sebastião rainfall station, monitored by CEMADEN, had records of 207.6 mm of accumulated rainfall in three hours and about 548 millimeters in 24 hours.

Also according to the DRM-RJ (2022), there was a reactivation of mass movement processes, due to new rainfall on March 20. The city's infrastructure and service systems for the population were still in the process of resuming normality, the Piabanha and Quitandinha rivers overflowed again, causing flooding processes in several areas of the 1st and 2nd District. With the end of the rescue and rescue actions conducted by the Fire Department, it was identified that the new disaster scenario resulted in 7 deaths, totaling 241 deaths.

RESULTS AND DISCUSSION

The data collected in the research had the purpose of explaining disasters involving mass landslides, through a comparison of data to possibly relate human and environmental factors that aggravated and triggered the disasters, with the objective of prevention and resilience of the affected society.

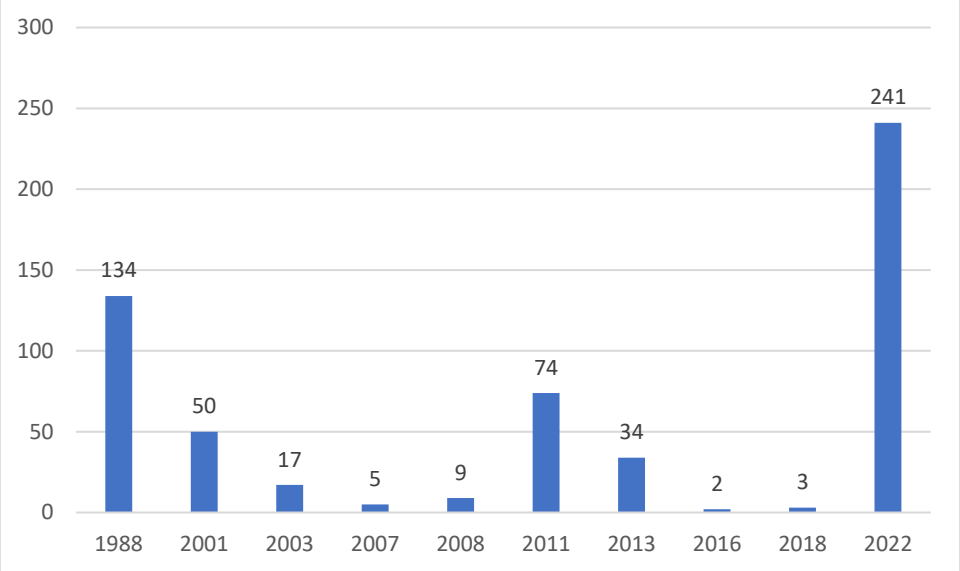
In the municipality of Petrópolis, it was possible to perceive the frequency of landslides and verify the seasonality and recurrence of these disasters. As pointed out by the PMRR (Prefeitura Municipal de Petrópolis, 2017), in addition to the geology of Petrópolis, the municipality is located

in the Brazilian humid tropical region, where the rainy season occurs in the months of October and March, with more intense rains in the summer season, between December and March. The recurrence of landslides is associated with the rainy season and heavy rains.

The municipality of Petrópolis has been facing problems of irregular occupations. According to Wernke (2021), the term irregular occupations refers to constructions in areas of environmental prevention, such as slopes and river banks, occupations in places that do not comply with local regulations. It also points out that population growth, lack of affordable housing, poverty and other socioeconomic factors are directly responsible for the increase in irregular occupations. In Petrópolis, irregular occupations occur, for the most part, in risk areas, such as slopes or river banks, increasing the vulnerability of these communities to natural disasters, such as landslides and floods.

With the data collected, it was possible to compare the number of fatalities in disasters that involved mass landslides, as shown in graph 7 (Vianna, 2024). The graph was prepared from data obtained by the IPT database in conjunction with the EM-DAT database. Thus, the disasters with the highest number of victims were the years 1988, 2001, 2011, 2013 and 2022.

Graph 7 - Number of deaths from disasters, by year, in the period from 1988 to 2022.



Source: Adapted from Vianna (2024).

It is worth mentioning that in 2013 the climatic event did not result in a greater number of victims, as the affected region was in a rural area, with low population density, but with an intensity equal to or greater than in 2011. Ottero (2018) considers the events of the years 2011 and 2013 as events with accentuated or extreme rainfall indexes.

Also according to the graph, it is not possible to say that the harmful events in the municipality are gradually increasing, but it is possible to observe the conditioning of extreme events in the region, causing great damage and contributing to the increase in the general average of the data.

Chart 2, according to Vianna (2024), containing data and information on the characteristics of the disasters analyzed, was built through the database gathered from *The International Disaster Database* - EM-DAT, the database of the Institute for Technological Research - IPT, the Digital Atlas of Disasters in Brazil, the Disaster Information Forms - Fide provided by the National System of Civil Protection and Defense - SINPDEC and the book "Occurrences of Natural Disasters from 2000 to 2012: Annual Data on Floods and Landslides by Municipality and Hydrographic Region, VOL II, published by the State Institute of the Environment - INEA.

Table 2 - Characteristics of the main disasters in the municipality of Petrópolis, in the period from 1988 to 2022.

Year	**1988**	**2001**	**2011**	**2013**	**2022**
Date	05/02/1988	23/12/2001	11/01/2011	17/03/2013	02/15/2022 and 03/20/2022
Rainfall Index	Not pointed	190mm in 12 hours	130mm in 24 hours	459.5mm in 24 hours	548mm in 24 hours
Classification (COBRADE)[4]	-	-	12200	11321	13214
Subtype (COBRADE)	Plots/Slips	Plots/Slips	Floods	Slips	Local/Convective Storm - Heavy Rainfall
Dead	134	50	74	34	241
Wounded	600	196	25	49	40
Evicted	1000	5187*	6956	1120	9465
Homeless	4000	-	187	1074	3709
Affected	-	5363	7269	152277	193458
Damage to the Public Sector	-	R$ 22.736.889,5 **	R$ 66.974.505,7 ***	R$ 41.060.500,00	R$ 23.100.000,00
Damaged/Destroyed Housing	-	-	-	875	3258
Neighborhoods	Center, Morin, Alto da Serra, Quitandinha, Bingen, Araras and Côrreas.	Quitandinha, Vila Felipe, Morin, Capela, Côrreas.	Itaipava and Vale do Cuiabá.	The 1st, 2nd, 3rd and 4th districts. Most affected Quitandinha.	Alto da Serra, Castelanea, Centro, Caxambu, Chácara Flora, Floresta, São Sebastião, Valparaíso, Vila Militar and Quitandinha.
Causes	Heavy Rains	Heavy Rains	Heavy Rains	Heavy Rains	Heavy Rains

Source: Adapted from Vianna (2024).
*. Value for homeless and displaced.
**. Equivalent values for the entire month of December.
***. Equivalent values for the entire month of January.
- . No data available.

[4] Brazilian Classification and Coding of Disasters. MIN Ordinance 260/2022.

The months in which the disasters occurred were: January (01), February (02), March (02) and December (01), for the disaster of the year 2022 it was considered an event for the month of February and an event for the month of March, thus having a total of six occurrences of the disasters. The months correspond to the summer season, the period when the highest rainfall rates occur in the municipality. The days of the disasters were variable at the beginning, middle and end of the month. With this, it is noticeable to admit the cyclicality in which major events take place in the municipality. This is the starting point for the discussion, through a comparative analysis of the disasters that occurred, as detailed below.

The main causes of the selected disasters were heavy rains, where a characteristic of the disasters was the concentration of large rainfall in a short period of time, between 12 and 24 hours.

The typifications of disasters by COBRADE in Brazil (2022) were possible in the years 2011, 2013 and 2022, in the other years they were obtained through EM-DAT. The subtype of disasters were: flash floods/landslides, flash floods, landslides and storm/heavy rains.

The year 2022 had the highest number of deaths (241) and the penultimate year in number of injuries (40). The same year also had the highest number of displaced and homeless people, totaling 13,174 people and also with the highest number of affected people, 193,458 people, followed by 2013, with 152,227 people.

With the year 2022 having the greatest consequence in terms of human losses, it presented the penultimate number with emergency expenses caused in the public sector with R$23,100,000.00 and the year 2011 with the highest expenditure, with R$66,974,505.70.

The most affected neighborhoods were those in the region of the first district, being affected in almost all, with the exception of the disaster in 2011, where heavy rains occurred, but reached a rural area of the municipality, which is far from the center.

Regarding the neighborhoods most affected, the most affected by landslides were Quitandinha and Morin, both belong to the first district. According to Ambrósio (2008, p. 96) the Quitandinha neighborhood has 12,703 residents and still has a great tourist attraction, such as the Quitandinha palace, while the Morin neighborhood has 5,095 residents and has as its strong point the concentration of the textile industry.

The DRM classified the disaster of 2011 as a "Megadisaster" in the mountainous region, however, with the data collected in the present work, it was possible to identify the years 1988, 2001, 2013 and 2022 with the same climatic and meteorological conditions, high rainfall, widespread landslides and major floods. The disasters of these years presented the same conditions as the "Megadisaster", with widespread landslides and heavy rainfall.

CONCLUSION

The municipality of Petrópolis has a great altimetric variety of mountains and steep slopes, with shallow soil layers and fractured rocks, and also high rainfall. The municipality also suffered from the process of urban sprawl, directing the construction of residences in places considered risk areas, far from the center, with little or no public infrastructure, environmental protection areas, river banks and on slopes.

The conjuncture of demographic densification factors, urban sprawl, lack of public infrastructure, meteorological conditions (high rainfall), geological formation (shallow layer of soil), combined with constant climate change, makes the municipality of Petrópolis vulnerable to disasters. Such a context leaves the population more exposed to danger. In other words, the municipality is physically exposed to a threat of disaster.

In this context, it was essential to record the data that were compared in the years listed, related to the disasters, so that a specific analysis of the consequences of the disasters, recurrence, social, environmental and physical aspects becomes viable. In a way that can subsidize public policies, structural and non-structural interventions, preparation and planning, capable of minimizing or eliminating material losses and especially human lives.

Another important point identified, by the comparison made, were the neighborhoods of Quitandinha and Morin, as the most affected by landslides and deaths. As a result, it is necessary to quickly adopt preparatory measures to reduce losses in future events.

For the municipality of Petrópolis, in the first place, it is necessary to understand, on the part of federal, state, regional and municipal managers, and also of the entire population, that there is a climatic and geophysical vulnerability to landslides and the formation of floods and floods.

With the observation of the data, it was verified an urgent aspect in the municipality must have the correct use of the soil and its occupation, in addition to the need to adopt preventive measures to improve the flood systems in the municipality, such as drainage, desilting of rivers and streams.

The term Megadisaster, by the research, was adopted in reference to the disasters that occurred in Petrópolis, in the year 2011, where by the comparison elaborated, it was verified, finally, that the disasters that occurred in the years 1988, 2001, 2013 and 2022, had similar climatic and meteorological conditions.

It is concluded that the present work addressed the main aspects and conditions of disasters that have already occurred in the municipality, contributing to future work, in order to disseminate the culture of disaster prevention throughout the national territory and that these occurrences are not forgotten in the history of Petrópolis and are scientific paradigms for the large area of civil defense.

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The political-pedagogical projects of heritage education: An analysis of heritage education proposals present in UNESCO's international documents

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Ana Carolina Fernandes Gonçalves[1] and Caesar Luiz de Mari[2]

ABSTRACT

This text is a product of the research carried out for the Master's Degree in Education, whose object is the pedagogical political project presented by UNESCO for heritage education, through the initiatives encouraged by it for the preservation of cultural and natural heritage. From a qualitative research of documentary analysis of UNESCO's recommendations, declarations and conventions, it was possible to reconstruct the proposals and political uses of heritage education and political-pedagogical projects planned by this agency. The result presented is an overview of the pedagogical policy designed for heritage preservation and its economic exploitation, whether as a support for the creation of sustainable networks for traditional communities, responsible exploitation of cultural tourism by public and private agents, and scientific and pedagogical responsibility in the preservation of material and immaterial cultural assets. The contribution of this text is, in the end, a reflection on the importance of establishing criteria to evaluate the impacts of these political pedagogical projects on the public it targets.

Keywords: Heritage education, UNESCO, Cultural heritage, Political-pedagogical project, Evaluation.

[1] Federal University of Viçosa. Viçosa, Minas Gerais (MG), Brazil.
ORCID:https://orcid.org/0000-0002-8847-7852
E-mail: carolfernangon@gmail.com
[2] Federal University of Viçosa. Viçosa, Minas Gerais (MG), Brazil.
ORCID: https://orcid.org/0000-0003-0404-0328
E-mail: cezar.demari@ufv.br

INTRODUCTION

Heritage education is understood, in a general sense, as an educational action within a program or project for the preservation of tangible and intangible cultural heritage. Initially, such educational activities were carried out as complementary activities of the preservation program and a return of this program to society, as can be observed in museum education initiatives and archaeology projects. However, the contribution of educational activities shifted in the list of priorities from the expansion of the concept of cultural heritage, when it began to encompass the set of assets denominated as immaterial, such as knowledge, celebrations, language and ways of life.

Currently, heritage education is at the center of many preservation projects , being systematized in national formal and non-formal education programs, such as the National Plan for Education and Heritage prepared by the Spanish government (MINISTERIO DE EDUCACIÓN, CULTURA Y DEPORTE, 2015) and the Brazilian guidelines established in the Ordinance 137/2016 of the National Institute of Historical and Artistic Heritage (IPHAN, 2016a), an end activity in local tourism programs, such as projects conducted by NGOs, Secretariats and Institutes, such as the community-based tourism project in Caiçara territory (BARROS and RODRIGUES, 2019) but, above all, one of the preservation methodologies when conducted in and by the local community, as is the case of the Participatory Inventory methodology created by IPHAN (IPHAN, 2016b).

As an object of study, heritage education is complex and slippery, since it is offered by various agents, such as schools, museums, tourist services, printed materials, in a formal and non-formal way. In addition, it has varied methodologies defined according to the patrimonial asset involved and also varied objectives, which require constant critical evaluation, since it can be at the service of both a project of emancipation and the conservation of exclusionary and subordinating hegemonic narratives, as denounced by Nestor Canclini (CANCLINI, 1994).

Due to its multidisciplinary nature, the academic literature on Heritage Education is also diverse. There are studies that deal, in general, with its history and systematization (DEMARCHI, 2016; FRANCO, 2020; HORTA et al, 1999; LACERDA, FIGUEIREDO and PEREIRA, 2015; MARCHETTE 2016; OLIVEIRA, 2019; VALECILLO, 2017), its planning as a political program (FLORÊNCIO, 2019; FONTAL 2016, VALECILLO 2012), school and tourist experience reports (BARROS and RODRIGUES, 2019; MACHADO et al, 2009; MELO and CARDOZO, 2015;

SILVA et all, 2016;) and criticism (SCIFONI, 2012, 2017, 2019), to name a few. In this broad literature, international documents are cited as references that guide the work of theoretical research and political-pedagogical practice.

The *Heritage Letters*, as they are known, are international documents and are also incorporated into different groups of documents, produced by different national, regional and international organizations (see if the meaning I gave when changing the text is correct). In general, under this epithet

are grouped recommendations, declarations and conventions of UNESCO for Member States on the preservation of tangible and intangible natural and cultural heritage, but also recommendations of organized civil society such as *the International Council of Museums* - ICOM, *the World Council on Monuments and Sites* - ICOMOS, *the International Center for the Study of the Preservation and Restoration of Property Cultural* - ICCROM, *International Society of Modernist Architects* - ISMA, and governmental organizations such as *European Council* - EC. In addition to a contract or an official communication, these documents express the consensus and divergences regarding heritage preservation. According to Jurema Machado, former president of IPHAN:

> These letters are the main representatives of the effervescence of thinking about heritage, more frequent and innovative in these thirty years than in those that followed. Far from being a finished recipe, or an "application manual" of conservation theory, the charters reflect, like the instruments of UNESCO, the consensus possible at a given historical moment, a consensus that generally originates from culturally and politically very diverse collectives. For this reason, they are often limited to general issues, often unfolding into regional or national letters, as there are several examples of Latin American or Brazilian letters. (MACHADO, 2017, p. 264).

In this text, the results of documentary research, whose primary source are these *Heritage Letters, will be presented synthetically*, with the aim of identifying the political role that heritage education assumes in international relations, through bilateral and multilateral agreements between countries and between countries and international organizations, more specifically UNESCO, responsible for providing Technical advice and management of international programs for the protection of world heritage and its own fund for this purpose.

To conduct it, a qualitative research of textual analysis of 21 documents on heritage preservation produced by UNESCO between the years 1930 and 2015 was carried out, which directly mention education as an important initiative within the recommended or agreed safeguard measures in relation to the various situations of threats such as armed conflict, terrorism, lack of resources, time, industrialization, modernization, subordination and prejudice. In all, there are 11 recommendations, 03 declarations, 05 conventions, 1 letter and 1 pedagogical kit.

This corpus was subjected to an interpretative analysis of three levels of depth. In the first and most superficial level, the reading of the *corpus* sought to identify the concept of education and the project for it, expressed in the documents and its relationship with the forms and methodologies identified by the researchers as *heritage education*; in the second level, the analysis considered the authors of the documents, local, national and international political actors, to highlight the political use of these heritage education projects; and, finally, in the third analytical level, we seek to locate these political-pedagogical projects for heritage education within the globalized scenario of international politics, in which the National States establish relations of cooperation, using the *glocal* concept. In this work, in each section, the results of the analysis at each level will be presented, with the data and synthesis tabulated,

accompanied by their discussion, followed by a suggestion presented as the final product and contribution of the research.

PROPOSALS FOR HERITAGE EDUCATION IN UNESCO DOCUMENTS

To understand what the international consensus understands by education related to the safeguarding of heritage, an analysis of 21 documents was carried out, summarized in chart 1, in which the extracted data are organized chronologically. Such data refer to the conception of education expressed in the document, the type of heritage referred to in the document, the responsibility for the educational initiative, the objective of the educational initiative and a keyword taken from one of the documents to represent the general idea.

The first observation that can be made from the data collected is about the chronological change in the meaning that heritage education undergoes over time (chart 1, column 1). This change does not only concern the objectives of education, but the very conception of heritage preservation. According to these data, it is possible to observe that the change in the way heritage education is understood is derived from the conceptual transformation of heritage and the displacement of responsibility for its safeguarding, as will be shown below.

Table 1. Comparative table of the term "education" used in UNESCO documents relating to the safeguarding of cultural and natural heritage.

Concepção de educação	Tipo de patrimônio	Responsabilidade	Objetivo	Frase chave	Documentos
1930-1960 Educação do público	Patrimônio cultural material local	Educadores, museus e outros órgãos ligados à preservação do patrimônio cultural local	Sensibilização: Educar o público para evitar a depredação e compreender a importância da sua proteção.	"Despertar e desenvolver o respeito"	Carta de Atenas de 1931 (IMO, 1931) Convenção de Haia de 1954: (ONU, 1954) Recomendação da UNESCO de 1956, Nova Delhi (UNESCO, 1956) Recomendação da UNESCO de 1960, Paris (UNESCO, 1960) Recomendação da UNESCO de 1962, Paris (UNESCO, 1962)
1960-1970 Programas Educativos	Patrimônio Cultural Material e Natural Mundial	Estado	Formação: Inserir o patrimônio cultural no currículo escolar como uma educação cívica.	"Estimular nos cidadãos o interesse e o respeito pelo patrimônio cultural e natural de todas as nações"	Recomendação da UNESCO de 1964, Paris (UNESCO, 1964) Recomendação da UNESCO de 1968, Paris (UNESCO, 1968) Convenção de Paris de 1970 (UNESCO, 1970) Convenção de 1972, Paris (UNESCO, 1972) Recomendação de 1976, Nairóbi (UNESCO, 1976) Recomendação de 1978, Paris (UNESCO, 1978)
1980 Ensino do Patrimônio cultural	Patrimônio Cultural Imaterial local	Estado	Integração: Inserir o patrimônio cultural no currículo escolar como parte da cultura nacional e local.	"Ensino Integral do patrimônio da Humanidade" para "revalorização".	Recomendações da Conferência Mundial de Políticas Culturais 1982 (UNESCO, 1982a) Declaração do México de 1982 (UNESCO, 1982b) Recomendação de 1989, Paris (UNESCO, 1989)
1990 Programa internacional de educação patrimonial	Patrimônio Cultural, Material e Imaterial, e Natural Mundial	UNESCO	Atuação: engajar a juventude na defesa do patrimônio a partir da práxis	"Conhecer, Estimar, Atuar"	Kit pedagógico (UNESCO, 2012)
2000 Política de Proteção	Patrimônio Cultural, Material e Imaterial, e Natural local, nacional, regional e Mundial.	Estado com Parcerias (ICOMOS, centros de categoria 2, Estados, voluntariado)	Mobilização: a educação é incluída como uma das medidas de proteção do patrimônio imaterial executada pelo Estado e comunidades.	"Educação, conscientização e fortalecimento das capacidades"	Declaração universal sobre a diversidade cultural de 2001 (UNESCO, 2001) Declaração de Paris de 2003 (UNESCO, 2003a) Convenção de 2003, Paris (UNESCO, 2003b) Convenção de 2005 (UNESCO, 2005) Recomendação de 2011 (UNESCO, 2011) Recomendação de 2015, Paris (UNESCO, 2015)

Source: GONÇALVES, 2022a (adapted)

The first initiatives to safeguard material and local heritage – generally understood as monuments and architectural ensembles – between 1930 and 1960, proposed an educational measure to raise awareness among the population, which should be carried out by local agents, museums and educators, with the aim of defending the safeguarding action (Table 1, line 1), as can be seen in the recommendation 1960 UNESCO specific policy to make these institutions more accessible to the public, including school visits:

> a. Creation in each of the museums, of posts of specialists in education in charge, under the authority of the director, of the use of the museum for pedagogical purposes;
> b. Creation of educational services in museums that can obtain the collaboration of the teaching staff;
> c. Creation at the local, regional or provincial level, of bodies in which museum directors and faculty participate with the aim of better using museums for pedagogical purposes;
> d. Adoption of any other measures that allow coordinating the requirements of education with the means available to the museum. (UNESCO, 1960)

It can be inferred, from these data, that the proposal to raise awareness of heritage education arose from the need to justify to society and to the State the cost of preserving material goods destroyed by war, neglect and abandonment, by the modernization of cities and by speculation in the real estate market. This need is also observed by geographer Simone Scifoni, when she analyzes, in the Brazilian context, the function of education in Mario de Andrade's pioneering discourse on the preservation of cultural heritage, pointing to the uniqueness, or even eccentricity, that such an idea would have had in 1930 (SCIFONI, 2019). For the researcher, for whom awareness is an "idea out of time", it actually contributes to the commodification of culture and the transformation of educational work into a formation of consumers who justify public spending. (SCIFONI, 2017).

However, from the 1960s onwards, but especially with the 1972 UNESCO Convention on World Cultural and Natural Heritage, heritage education ceased to be suggested as an initiative of local agents and became a public initiative for citizenship education (Table 1, line 2). Heritage education thus acquired a formal and scholastic character when it was included in school curricula with the aim of forming a cosmopolitan citizenship that recognized the universal value of cultural assets that should be considered for all humanity (UNESCO, 1972). The proposal for the formation of heritage education, therefore, seems to derive directly from the international cooperation plan to safeguard heritage assets of value to humanity, whose effort needs to be understood and defended. Education even appears in the 1972 Convention under the term "educational program" as a clause of the international cooperation agreement:

> VI – Educational programmes ARTICLE 27
> 1 – States Parties to this Convention shall endeavour, by all appropriate means, including through education and information programmes, to strengthen the respect and attachment of their peoples to the cultural and natural heritage defined in Articles 1 and 2 of the Convention.

> 2 – undertake to inform the public widely of the threats to such heritage and of the activities carried out in application of this Convention (UNESCO, 1972).

To get an idea of the impact of this Convention, in the USA, for example, where heritage education has been carried out in parks and museums since 1932 in a non-formal way, according to a survey carried out by Cathleen Ann Lambert, from the 1970s onwards, heritage education was offered in schools through the "Architects in Schools" program with classes in urban planning and architecture (LAMBER, 1996). In France, according to the entry for the *Dictionnaire critique des enjeux et concepts des 'éducations à*, Angela Barthes informs that in 1978 the theme "local heritage" was included in a transdisciplinary way in history, geography and arts classes, in accordance with the 1972 UNESCO Convention, and, in 1980, "heritage classes" were included in the primary school curriculum (BARTHES, 2017).

However, times change and political challenges follow one another. Identity and its relationship with culture and way of life became an important marker in UNESCO's discourse from 1980 onwards, when countries on the periphery of capitalism, from then on independent due to the decolonization process initiated in the post-war period, entered as Member States in UNESCO. This claim of peripheral peoples profoundly changed the meaning of heritage, which now includes intangible assets such as language, celebrations and traditional knowledge, included in UNESCO's discourse from the 1982 Declaration of Mexico, the result of the consensus created at the meeting for cultural policies, the Mondialcult of 1982.

Heritage education, already included in school curricula, as a cross-cutting theme or discipline, as a clause to participate in international cooperation actions, came to mean more than an education of the cosmopolitan citizen, since it was seen as a way to provide opportunities for social integration, through the recognition of their cultural identity and strengthening of ties with their ancestral traditions. The proposal for the integration of heritage education seems to be directly linked to the need to defend immaterial cultural manifestations, especially of colonized peoples, whose culture was erased and buried in the process of domination by the colonial elites.

> Education is the means par excellence for transmitting national and universal cultural values, and it must seek the assimilation of scientific and technical knowledge without detriment to the capacities and values of peoples.
> What is needed today is an integral and innovative education that not only informs and transmits, but also forms and renews, that allows students to become aware of the reality of their time and their environment, that favors the flourishing of the personality, that forms in self-discipline, respect for others and in social and international solidarity; an education that enables students to organization and for productivity, for the production of goods and services that are really necessary, which inspire renewal and stimulate creativity (UNESCO, 1982).

The economic policy of the 1990s had a strongly developmental international agenda, after the promulgation of the *1986* Declaration of the Right to Development by the UN, which led to the adoption of

the economic index of human development (HDI), created by the Pakistani economists, Mahbub ul Haq and the Indian Amathya Sen, in the reports of the United Nations Program for Development (UNDP) and the sustainable perspective (ecodevelopmentalism) of Ignacy Sachs (MARCHADO and PAMPLONA, 2008).

Developmentalism in the field of culture led UNESCO to direct international cooperation agreements to the promotion of creative industries in order to promote human development through sustainable development, expressed in the report *Our Creative Diversity* (UNESCO, 1995). In heritage preservation policies, these objectives are the result of the increasing pressure from the OAS to define and regulate cultural tourism, opening up the opportunity for public and private investment in tangible and intangible heritage, with a view to generating revenues finally included in the 2005 Convention.

UNESCO's educational initiative in this period was more assertive, since it abandoned the position of advisor producer of recommendations and mediator of international cooperation agreements to assume the role of educational agent, creating its own heritage education program, with the aim of engaging youth in the task of safeguarding heritage. Heritage education in this context took the form of youth and civil society as stakeholders in heritage preservation policies, assuming co-participation in the management of the safeguarding of World Heritage. The proposal for the performance of heritage education, in this case, seems to act directly on the economy by stimulating the participation of the cultural tourism market, whether as a qualified labor force for restoration, a political agent of protection or as a supplier of cultural products and services, as the themes of the handouts of the Pedagogical Kit prepared by UNESCO show:

> Book 1 - Educational Approaches to World Heritage
> Book 2 - The World Heritage Convention Book 3 - World Heritage and Identity Book 4 - World Heritage and Tourism
> Book 5 - World Heritage and Environment Book 6 - World Heritage and Culture of Peace (UNESCO, 2012)

As can be seen, UNESCO's international program differs from national heritage education programs, especially in the practical approach and appeal to the formation of employability to the detriment of more academic and conceptual curricula, proposed by government initiatives.

The first decades of the twenty-first century are, from the point of view of UNESCO documents on heritage preservation, the culmination of the debates that began in 1980. Cultural diversity is recognized in the 2001 Declaration, intangible heritage is finally defined in the 2003 Convention, and the way to protect it is agreed among the Member States in the 2005 Convention. Heritage education is no longer a means-activity in the safeguarding process to be an end-activity , since it is recognized as a strategy for mobilizing communities to define and manage their cultural heritage. The proposal to mobilize heritage education, therefore, seems to be linked to a larger project of sustainable development,

which includes traditional communities and their tangible and intangible heritage in an autonomous way in preservation policies and in the cultural market. As stated in Article 10 of the 2005 Convention:

> The Parties shall:
> [...]
> (c) Strive to encourage creativity and strengthen production capacities through the establishment of education, training and exchange programmes in the area of cultural industries. Such measures should be applied in such a way that they do not have a negative impact on traditional forms of production.
> (UNESCO, 2005)

In summary, Heritage Education has taken on several meanings in the international discourse of heritage preservation, varying according to the expansion of the concept of heritage itself and the political and economic objectives included in the safeguard projects and programs. Although such differences appear in a chronological pattern in the documentary analysis, such meanings and objectives are not exclusive and do not disappear over time, as can be seen in the various typologies created to describe the diversity of Heritage Education.

The Spanish researcher Olaia Fontal Merillas (2016) and the Ecuadorian Zaida Valencillo (2012) used different markers to describe educational practices with heritage, such as "approaches", "models" and "strands". For Valencillo (2012), the pedagogical perspective adopted by educators can be observed in pedagogical projects as the "focus" given to heritage. There are 4 approaches (chart 2, column 3) described by Valencillo (2012):

- Education with heritage;
- Education of (about) heritage;
- Heritage education;
- Heritage Education.

When the project provides for a pedagogical practice with heritage, it is taken as a didactic resource. This focus appears, for example*, in IPHAN's 1999* Heritage Education Guide, one of the main references in Heritage Education. In it, the didactic sequences are thought of from the direct relationship, manipulation and observation of heritage assets, mainly material (HORTA, 1999), an illustrative work of this approach is the analysis made by Guimarães Júnior (2020) on the didactic sequences of heritage education in textbooks for elementary school, in thewhich the author points out the use of didactic resources such as color images as a means of observation, interpretation and reflection, visit itineraries and digital tour activities through museums, requiring greater preparation and training from the teacher (GUIMARÃES JUNIOR, 2020).

In pedagogical approaches to heritage, it is translated as curricular content, in general, as a transversal theme of History, Arts and Sociology classes, in theoretical didactic sequences on the aesthetic, historical, anthropological value of assets. A critical, illustrative analysis of how cultural

heritage has been incorporated into the history curriculum, for example, can be found in the work published by Mendes and Nunes (2021), in which a critical observation is made regarding the lack of more topics related to traditional cultures, such as forest peoples and quilombolas, and an indirect approach to cultural heritage, which requires greater teacher training.

On the other hand, when the pedagogical proposal focuses on education for heritage, it is taken as a moral or political principle mobilized to engage the subject in its defense. An example of this approach is the proposal of the *UNESCO Pedagogical Kit*, whose objective is to train young people to work in heritage protection, presenting the legislation, the pros and cons of tourism, the need to respect diversity and promote peace (UNESCO, 2012). Another very illustrative material of focus is the *Creative Manual for Heritage Education* produced by IEPHA for teachers, in which it is possible to visualize the educational purpose in the guidelines given to educators:

The preservation of cultural heritage must be a constant concern of the educator who is conducting the activities. They must keep themselves informed about the importance of preservation in order to dialogue with their group and reinforce the necessary care for heritage assets, especially at the time of visitation and exploration in the field. (IEPHA, undated, p. 25)

Finally, there are also heritage education projects when the processes of heritage and identification are taken as pedagogical objectives, as occurs in the Participatory Inventories methodology created by IPHAN, in which the practice gives communities the opportunity to identify their heritage, semantize them from their practices and plan the best way to preserve it. An interesting work of participatory inventory used with heritage education is the final product of Santos' dissertation in the recreation of an old religious procession with the children and the image that participated in it, through the recovery of the community's memories (SANTOS, 2019).

Fontal (2016) distinguishes models of education, based on the didactic approach adopted in pedagogical projects. She described eight didactics adopted in these educational initiatives (chart 2, columns 4 and 5):

- Transmissive model;
- Conceptual model;
- Receptive model;
- Contextual model;
- Investigative Model;
- Constructive model;
- Relational model.
- Procedural model;

In the transmissive model, heritage is worked as an object of knowledge transmitted by the educator through data, facts and dates. This approach is common to school education, especially in

history classes. In the conceptual model, heritage is defined and explained by a theoretical approach, through concepts and principles, as in theoretical art education, in which the asset is defined by technical criteria. Both didactics are more common to formal and theoretical education, in which heritage is part of the curriculum as a cross-cutting theme or topic of a syllabus and the common discursive genre is informative and essay, such as those textbook contents critically analyzed by Guimarães Júnior (2020) and Mendes and Nunes (2021).

On the other hand, the receptive model approaches heritage based on the student's previous knowledge , usually acquired through excursions to archaeological sites, monuments, exhibitions and museums. While in the contextual model, it is usually presented *in situ*, revealing its relationships with the natural, social and cultural environment, as it usually happens in field visits, guided tours and tourist itineraries. These approaches are closer to non-formal pedagogical practices, such as Museum Education and pedagogical tourism, in which the discursive genre adopted is heritage interpretation , present in the work of Silva, Neves, Neves and Arruda (2016), in which a tourist route is prepared for the educational purposes of tourists, or the *Creative Manual* of IEPHA(undated), in which the didactic sequences contemplate the body and the territory as part of the journey of heritage recognition.

On the other hand, the didactic approaches common in investigative and constructive models are closer to pedagogical projects of technical and professional training. In the investigative model, heritage is scientifically translated through anthropological, historical, and geographical relationships, as can be seen in courses, inventories, reports, and academic dissertations. This model is present in works such as that of Marchete (2015) for whom heritage education coincides with the elaboration of the city's master plan, since access to heritage assets is a form of education for the population. On the other hand, the constructive model is based on immersion learning , in which students learn by participating in practices related to heritage, such as workshops aimed at transmitting a craft craft, a dance, a language, always aware of its heritage value and the importance of preserving it, this model is described and defended, for example, by Lacerda, Figueiredo and Pereira (2015).

Engagement is the pedagogical objective of social projects that have as their target audience the youth and the community as protagonists of the heritage safeguarding process, from the process of listing, management and tourist exploitation, such as the one experienced by Barros and Rodrigues with the Caiçara community in Paraty (2019) and the participatory inventory made by Santos (2019) with the community and children. In the relational model, pedagogical strategies are articulated to stimulate the protagonism of the community involved through forums, projects and volunteer work. While in the procedural model, preservation agencies, whether public or private, mediate the process of identifying heritage assets, providing opportunities for self-recognition and self-management of cultural heritage by communities. Both are related to the pedagogical practices known as sociocultural animation.

Table 2. Approximation between the meanings and objectives found in international documents on heritage safeguarding and the descriptions made by Fontal (2016) and Valencillo (2012) of Heritage Education.

CONCEPÇÃO	OBJETIVO	ENFOQUE	MODELO	ABORDAGEM	VERTENTES
Educação do público	Sensibilização	Patrimônio como recurso didático	Receptivo/ Contextual	Educação museal, Interpretação do patrimônio	Educação não formal
Projetos Educativos	Formação	Patrimônio como conteúdo curricular	Transmissivo/ conceitual	Educação formal e teórica	Educação formal
Ensino do patrimônio	Integração	Patrimônio como um princípio étnico/ético/político	Construtivo/ investigativo	Educação técnica e profissional	Educação técnica e profissional
Engajamento social	Atuação / mobilização	Patrimônio como práxis	Relacional/ Processual	Animação sociocultural	

Source: GONÇALVES, 2022a (adapted).

In addition to the heritage approaches and didactic models, Valencillo (2012) also describes three strands for Heritage Education, considering the form it takes depending on the circumstances in which the educational practice occurs. For the researcher, heritage education can take the form of curriculum design, when it is planned for basic and higher education; as museum education, with itineraries and trails designed for pedagogical tourism in various types of museums and in tourist services to monuments, parks, historic cities, in which there is physical or virtual contact with heritage assets, and as an interpretation of heritage when information is offered to the public through lectures, folders, videos, labels, totems, and others (VALENCILLO, 2012). Based on these three strands of Valencillo, we propose the inclusion of heritage interpretation in a higher category, to education for technical and professional training (GONÇALVES, 2022b), to include, in addition to interpreters, tourist guides and cultural animators whose job is to mediate the public/heritage relationship, the necessary training of restorers, analysts, and masters of trade, thus comprising all the training of qualified labor, both for research , interpretation, preservation and restoration of heritage, as well as for the crafts and arts of the creative economy for the sustainability of heritage.

The result of the approximation of the policy proposals for heritage education and the pedagogical descriptions points to the existence of four different proposals, summarized in chart 2, which could be organized into three strands: non-formal education (chart 2, line 1) - carried out by public and private institutions related to heritage preservation projects -, formal education (chart 2, line 2) – executed by the national or regional education system -, and professional and technical education (table 2, lines 3 and 4) – defined by international consensus and determined in cooperation agreements.

THE POLITICAL PROJECTS OF HERITAGE EDUCATION

From the proposals found in the analysis of UNESCO's international documents and the comparison of these with the focus of heritage and models, with pedagogical approaches from the

strands of heritage education, it was observed the pattern of three pedagogical proposals that are politically distinguished by the agency responsible for designing and operationalizing them as a political project. Such agencies vary between local - such as communities, NGOs, private companies, municipal secretariats -, National or Regional - such as the government of the National State and regional councils such as the Council of Europe - and even international - such as UNESCO itself (Table 3).

Table 3. Synthesis of the discussion on the results of documentary research and comparison with the literature on heritage education.

PROJETOS POLÍTICO PEDAGÓGICOS	SETOR PUBLICO	CAMPO DE ATUAÇÃO	VERTENTE DE EDUCAÇÃO	ÁREA DE ATUAÇÃO
Local	Economia	Mercado turístico	Educação não formal com foco no patrimônio como recurso didático.	Museus, Exposições, parques,
				Sítios, parques e reservas
Nacional ou Regional	Educação	Sistema Educacional	Educação formal com foco no patrimônio como objeto de conhecimento e princípio ético/estético/político de vida.	Currículo do Ensino básico e superior
				Formação Docente
Internacional	Cultura	Entidades e órgãos de salvaguarda do patrimônio	Educação Técnica e profissional com foco no patrimônio como exercício profissional e modo de vida.	Qualificação de mão de obra para preservação e restauro
				Formação em artes e ofícios tradicionais

Source: authorship.

In this pattern, there is the design of an educational plan for the public, with the objective of sensitizing the citizen and democratic conscience, working directly with the heritage through itineraries, trails and guides with environmental and historical responsibility, within a local political planning of cultural tourism, promoted by the agents responsible for the management of the local heritage (chart 3, line 1). This political pedagogical project is the most common in scientific publications, in which schools, universities, NGOs, Culture Houses, Heritage Houses, regional secretariats of IPHAN are found as agents. In them, initiatives by local actors are described, who, alone or coordinated, prepare and execute a heritage action plan with the local community.

Another political project outlined is focused on education for citizenship based on the recognition and respect for cultural diversity, designed as a school curriculum with the objective of training children and young people and as a teacher training curriculum for teaching, with the aim of guaranteeing formal heritage education, within a regional or national education program (chart 3, line 2). This model of political project is the object of research by Olaia Fontal and the observatory of Heritage Education of Spain, and one of its examples is the aforementioned National Plan for Heritage and Education of the Spanish government (MINISTERIO DE EDUCACIÓN, CULTURA Y DEPORTE, 2015), but also the model of integrated heritage education designed in Ordinance 137/2016 of IPHAN (IPHAN, 2016a), in which it is offered as a curricular complement in full-time education . Or even, in didactic materials, whose wide and diversified use such as the *IPHAN Heritage Education*

Guides and (HORTA, 1999; IPHAN, 2016) and IEPHA, and in the incorporation of Cultural and Natural Heritage in textbooks, via National Guidelines.

Finally, it also appears as a political project, a professional and technical education program for the training of workers in the creative economy, encompassing technical training in conservation and restoration, tourist services, planning and management of heritage assets, as is explicit in the UNESCO Heritage Education program, but also in the professional master's degree of the UNESCO Heritage Education program.IPHAN and public universities, professional courses for cultural tourism and heritage management, in addition to training in traditional crafts and arts (table 3, line 3).

Although such technical and professional training projects are often carried out by national or local agents, the design of this political pedagogical project is the result of international consensus whose premises are based on UNESCO's recommendations, declarations and international conventions and *Heritage Charters* of restoration, tourism, authenticity among other topics, produced by international professional councils such as ICOM, ICOMOS and ICCROM. These political projects are common in scientific articles that deal with the theme of community-based tourism , in which arts and crafts are part of the tourist circuit, in view of the UNESCO Conventions of 2003 and 2005.

THE PROBLEM OF CITIZENSHIP IN THE POLITICAL-PEDAGOGICAL PROJECTS OF HERITAGE EDUCATION

As previously noted, Heritage Education, although it is planned and executed on different scales, the actions take place in the same cultural territory and, therefore, end up taking the form of glocal pedagogical political projects, that is, initiatives in which local and global actions and agencies are superimposed. Considering this characteristic can be fundamental to evaluate the impact of the political-pedagogical project in order to avoid, at the same time, two undesirable excesses. The first would be the selection, supported by a more globalized perspective, of didactic approaches that mischaracterize heritage itself or that reproduce the hegemonic discourse, whose contribution would only be to maintain the state of subordination of cultures that are already silenced. The second would be the maintenance of radical values and practices, which may exist within traditional thinking and community practices, which constrain and disrespect minds and bodies, such as misogyny, ableism, racism, and others.

These unwanted excesses, according to our interpretation, are collateral effects of what Canclini (1994) called "ambivalences in the uses of heritage", which are directly linked to the "imaginaries of preservation". In the assessment of Canclini (1994), it is not possible to escape the ambivalences in the use of heritage and its disputes of interests, and the only solution is to try to predict them when designing preservation plans. Both the market, the public power or even society have conflicting initiatives: a market has economically sustainable strategies for safeguarding, but alienates the cultural good as a commodity; the tutelage of the public power is more responsible, but it uses it as nationalist

propaganda; the force of contestation of civil society is powerful, but only appears in moments of crisis.

Under these conditions, a viable solution would be the evaluation of the pedagogical political projects for Heritage Education. To avoid such unintended effects, projects need to be evaluated simultaneously in their local, national and global aspects. According to Lourenço (2014, n.p.), the concepts of glocal and glocalization convey "the need for a careful reading of the complexity of the local-global relationship, in which the globalization of the economy and the digital revolution play a decisive role." For this glocal evaluation, however, some questions posed by the critics should be considered.

Simone Scifoni (2017), in her article *Challenges for a new heritage education*, stressed that this is a social right, insofar as it is the empowerment of the subject of their culture and the possibility of using it as a tool to exercise citizenship, participating in the translation of their own history and culture. This practice, however, the geographer noted, needs to be detached from the immediate purposes of the work of listing and included in the education system, not as an imposition, where cultural objects are predetermined, but as a construction, where cultural references exist and represent the culture of a certain group, in a democratic and inclusive way.

In the article *Knowing to preserve: an idea out of time*, Simone Scifoni (2019) returns to the possibility that the political use of heritage education can move it away from its purpose, when awareness, taken within the formula "sensitize[eductize] to preserve" is used as a resource for political justification of certain decisions about the collective good, as this heritage education has contributed to symbolic violence through the imposition of dominant narratives, the imputation of responsibility for neglect and neglect of property to the community, when it is often an omission of the protection service itself, stimulated by the pressure of the real estate and tourism market. Within this logic, a political pedagogical project of heritage education could not, therefore, be based on technicist proposals and temporally outdated and depoliticized principles, which confuse pedagogical objectives with political strategies of symbolic domination.

Juciene Ricarte Apolinário (2012), in turn, draws attention to the interdisciplinary aspects of heritage education and criticizes the approach only for the content of history, as the study closed in the discourse about the past limits the presupposed objectives of citizenship construction. Heritage Education, according to this author, needs to connect the global and the local, confronting different temporalities. Following a similar critical line, João Lorandi Demarchi (2016) defends, supported by a bibliography common to researchers in the area, such as Edgar Morin, Paulo Freire, Liev Siemovich Vygostky and Boaventura Souza Santos, a heritage education that works together with the local community and considers not only the other as a subject, but other pedagogies, thus overcoming banking education, allowing the development of understanding, pertinent knowledge and presence.

According to these observations, the political pedagogical project for heritage education, in order to guarantee the exercise of citizenship, would need to be interdisciplinary, open to the future and guarantee the participation of the *other* and their pedagogy, bringing the other epistemologies not contemplated by the traditional curriculum. From the glocal point of view, therefore, a political-pedagogical project of Heritage Education needs, at the very least, to be faithful. In other words, heritage education could not avoid fidelity to the community, owner of the heritage, and it was necessary to have instruments to prevent both biased and decontextualized interpretations of the practices that gave rise to it, as well as the alienation of its owner, the community. For this, it is necessary to train good interpreters, both professionals specialized in the universal code of safeguarding, and professionals from the original community, since the dialogue is two-way, from the inside out and from the outside in.

To ensure fidelity to the local culture, the project should be based on the study of the community with the identification of who performs the pedagogical function in it, that is, who is the master, the sage for that community, what legitimizes it as such and what are the pedagogical practices performed by him/her, and position this actor as the heritage educator.

To ensure fidelity to pedagogical systematization, it is important when proposing a national plan, for example - the project should not neglect cultural dynamics in the name of universalization, such as the one we find in the structure and functioning of school education. Heritage education is, first and foremost, a popular education and, even when it is provided for in the school curriculum. Therefore, it would be important for it to reproduce the experience of approximation between subject and object and not the separation between them, as is presupposed in philosophical and scientific experience. In other words, it is the heritage and its community that determine the pedagogical approach and not the system, which should only reproduce it, as faithfully as possible, exchanging the classroom for the field or the workshop, the lesson for the ritual, the test for the celebration.

Finally, in order to ensure fidelity to universal principles, such as Human Rights, the objective of the heritage education project should be able to reveal the contradictions, without, however, announcing or judging them. In this ideal perspective, it would create conditions for the community itself, the project's audience, to be able to think and find solutions to its own contradictions, updating itself through internal consensus, conducted by its own leaders and intellectuals. That is, the evaluation criteria, of right or wrong, of adequate or inadequate, are not given *a priori*, based on foreign references to the community that owns the heritage, but are the result of debates and pacts made internally, among its members, and also externally, between the community and other agencies.

Finally, if, as André Comte Sponville, 1999, p. 17) defines fidelity in his *Little Treatise on the Great Virtues*, "fidelity is a virtue of memory, and memory itself as a virtue", then to be faithful is, in the end, not to forget. Therefore, to evaluate a political pedagogical project by its fidelity is to test the memory

of that project, its ability to remind the cultural values of the local community, the political-economic interests of citizens and the international rights of human beings and the environment.

FINAL CONSIDERATIONS

The analysis of the documents prepared by UNESCO revealed that during the 74 years that passed between the first and the last document issued, the notion of political-pedagogical project was crystallized in the agreements until it took the form of methodologies, national and international programs of heritage education. Education proposals have shifted from a peripheral role within preservation policies to a strategic role in the protection and promotion of heritage assets, in response to experimentation and new demands. The heritage letters that make up the *corpus* analyzed materialize the agency's initiative, through recommendations to member states and the agreement of multilateral agreements between them, to encourage the protection of cultural heritage as a policy linked to sustainable economic development. In these action plans, educational proposals assume, over time, an increasing role in the promotion of a certain economy through the formation of consumers and producers of cultural goods and services, when considering the actors and their roles in these agreed plans.

Based on this pattern of historical development of heritage education, from a supplementary action plan to a central strategic plan, it was possible to detect the condition of multiterritoriality present in political-pedagogical projects, which incorporate local, national, regional and global interests, which can often be conflicting. This glocal nature of the projects, therefore, creates a political-pedagogical difficulty in consolidating, in the same project, relative competencies and skills in respect for both cultural expressions of identity and universal rights. The suggestion launched in this work, in order to maintain the glocal balance of these projects, is the adoption of a criterion for evaluating the projects that considers the fidelity of the action plans in relation to the memory of the community served, not only of its values, but of its practices of transmission of these and its mechanisms of updating, recreation and incorporation of new values. In other words, the idea is to observe whether the political pedagogical project for heritage education contemplates not only identification and appropriation, but also criticism as part of the culture to be preserved and promoted.

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Evaluation of care for elderly women with oncotic pap smear abnormalities in a referral unit

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Adna Sandriele Oliveira de Lima Medeiros[1], Vanessa Caroline Pinheiro Martins Resende[2], Caio Medeiros de Oliveira[3], Nádia Martins de Paula Souza[4] and Sádia Martins de Paula Souza[5]

ABSTRACT

Genital infection by the Human Papillomavirus (HPV) is the most frequent sexually transmitted infection in women and its prevalence is associated with risk factors such as: early initiation of sexual life, multiplicity of sexual partners and non-use of barrier methods. Studies show that despite the decrease in the risk of infection in relation to the general age group, a peak is recorded in women aged 65 years, with an increase in the prevalence of HPV. This fact is associated with increased longevity and better conditions of the population, which make them more active, with better quality of life, interests and sexual expressions. Studies addressing HPV infection in elderly women are negligible, although some aspects corroborate the occurrence of a peak in HPV prevalence at 65 years of age. Therefore, investigations that support this foundation are necessary to increase the scope of available information on HPV in this population group.

Keywords: Elderly, Oncotic Pap smear, Human Papillomavirus (HPV).

[1] Physician, resident in Gynecology and Obstetrics at FEPECS/DF
Department of Health of the Federal District
Brasilia-DF
E-mail: adnasandriele@yahoo.com.br
[2] Physician, resident in Gynecology and Obstetrics at FEPECS/DF
Department of Health of the Federal District
Brasilia-DF
[3] Gynecologist
Department of Health of the Federal District
Brasilia-DF
[4] Gynecologist
Department of Health of the Federal District
Brasilia-DF
[5] Gynecologist
Department of Health of the Federal District
Brasilia-DF

INTRODUCTION

Human papillomavirus (HPV) infection is currently considered the most common sexually transmitted infection in the world. It is estimated that about 600 million people are infected with HPV and that at least 80% of the sexually active population has some contact with the virus throughout their lives (CARDIAL et al, 2017).

Especially in the female population, it is possible to see that in Brazil these estimates vary between 13.7% and 54.3% of women, which makes the country one of the world leaders in incidence for this infection (TAMAYO-ACEVEDO et al, 2014; COSER et al, 2012; GASPAR et al, 2015).

HPV infection began to draw the attention of the scientific community around the 1980s, when there was a correlation between cervical cancer and lesions caused by the presence of the virus (NEGRÃO et al, 2018). Currently, HPV is considered the virtual cause of about 100% of cases, as the analyses allow us to find the presence of viral DNA in 99.7% of cervical cancer events, which is why it is considered the greatest cause and effect relationship between an agent and cancer in humans (CARDIAL et al, 2017; WHO, 2016).

Cervical cancer is currently the fourth most common type of neoplasm among women in the world, with about 530 thousand new cases and 265 thousand deaths per year, thus also occupying the fourth position among the causes of cancer death in the female population (INCA, 2020).

In Brazil, the final estimate for each year of the 2020-2022 triennium was 16,590 new cases of cervical cancer, with an estimated risk of 15.43 cases per 100 thousand women, thus being the third most incident cancer estimated for 2020, behind only breast and non-melanoma skin cancer (INCA, 2020).

The Human Papillomavirus has more than 200 types of variations, however the most frequent related to cancerous lesions are the HPV-16 and HPV-18 types, they are present in 70% of cervical cancers and are also the most frequent among HPV-related cancers from other sites, such as the vagina, vulva, anus, penis and oropharynx (CARDIAL et al, 2017; WHO, 2016).

With regard to high-grade infections, it is also possible to see a highlight for HPV type 16, it is the most prevalent among genital tract infections, reaching up to 66%, followed by types 18 (15%), 45 (9%) and 31 (6%), however adding this 4 type of HPV, they can correspond to up to 80% of all cases of cervical cancer (TSUCHIYA et al, 2017).

Type 16, in addition to being the most common type detected in invasive cervical carcinoma in almost all parts of the world, is also considered the most persistent. This type has an infection lasting 12 months or more, while infections with other types of HPV last for about 6-8 months. Therefore, women with HPV 16 have an increased risk of developing cervical cancer when compared to those with other types of the virus (UK National Screening Committee, 2016).

Regarding the characteristics of the affected population, it is possible to notice that the first peak of incidence occurs around the second decade of life and a second peak occurs between the fifth and sixth decade of life (CARDIAL et al, 2017). In Latin America, for example, studies have observed that the second peak in HPV prevalence has a greater effect on women over 55 years of age (FRANCESCHI, 2006).

Overall, Guedes (2020) states that the highest incidence of cervical cancer is found in women aged between 40 and 60 years and points to a lower frequency before the age of 30, and relates this finding to the fact of the long period of evolution of HPV infection, until the appearance of cancer.

The World Health Organization understands the persistence of HPV infection as a factor responsible for cervical cancer, but it is not the only factor for the evolution of the disease. Thus, it points to the association with other risk factors, such as early initiation of sexual activity, high parity, multiplicity of sexual partners, in addition to smoking, low socioeconomic status, and prolonged use of oral contraceptives (CARVALHO et al, 2017; SIMÕES & ZANUSSO, 2019; FERLAY, 2018).

As it is a sexually transmitted virus, its prevalence has been increasing considerably worldwide due to numerous factors, including behavioral changes, longevity, and changes in sexual patterns of the general population in view of the elderly (NEGRÃO et al, 2018).

Most sexually active women will have contact with the virus at some point in their lives. However, more than 90% of these new infections will undergo spontaneous regression around 6 to 18 months, many of them triggered by the host's own immune response (NEGRÃO et al, 2018; INCA, 2016). However, the literature points out that the risk of acquiring a new type of HPV seems to be independent of previous infections by other types, as well as co-infection with multiple types of HPV and sequential infection with new types is quite common (GUEDES, 2020; INCA, 2020). Regarding the peaks of incidence and associated risk factors mentioned above, for example, it is possible to predict that the first peak may be related to the onset of sexual activity and other biological mechanisms, including cervical immaturity, inadequate mucus production and increased cervical ectopy, which may make young women and adolescents susceptible to this type of infection (CARDIAL et al, 2017; GUEDES 2020, Zhang, 2020), while the second peak can be explained by new exposure or loss of previous immunity, the immunity of climacteric women is weakened by several age-related factors, including systemic and local hormone deficiency (SASAGAWA, 2012; WHO, 2016.

Cervical cancer (CC) is a chronic disease that can originate from intraepithelial alterations in the squamous epithelium of the ectocervix (squamous cell carcinoma – SCC) or the columnar squamous epithelium of the cervical canal (cervical adenocarcinoma – ACC), which can become an invasive process [World Health Organization (WHO), 2014]. The most frequent histological types

are squamous cell carcinoma (80% of cases) and adenocarcinoma/adenosquamous carcinoma (about 20%) (CARDIAL 2017).

In Brazil, the Ministry of Health's cervical cancer prevention policies have recommended, since 1998, the performance of oncotic cervical smear tests for early detection of cervical cancer in all sexually active women, aged between 25 and 64 years. In the context discussed above, which deals with changes in the behavioral patterns of the general population, especially the elderly, and in view of the second peak already pointed out in the current literature, we noticed that the guidance regarding the focus group does not cover the population aged 65 years or older, who would also be within the risk group for the pathology.

This fact deserves reflection within the context that cervical cancer has one of the highest potential for prevention and cure, which comes close to 100% when diagnosed early. Its detection can also be carried out through the cytopathological test, a simple, easy-to-perform and low-cost test, which allows the discovery of precursor lesions of the disease in early stages, before the appearance of symptoms.

However, despite all the efforts and health policies already implemented, according to data from the Ministry of Health, in Brazil there are about 6 million women between 35 and 49 years of age who have never undergone the Pap smear test, which leads us to reflect on the efficiency and impact of current health education policies.

OBJECTIVES

The objective of this study was to demonstrate the alterations in the so-called abnormal oncotic smear smears (OCC) in women over 60 years of age, referred from the Primary Health Care Units to the onco-gynecology service of a tertiary hospital and, through the profile of this population, to stratify the main alterations found - severe atypia - high-grade intraepithelial lesion (HSIL), adenocarcinoma (AIS) and carcinoma (CA), in addition to analyzing the therapeutic approach proposed for women in this age group.

METHODOLOGY

This is a documentary, retrospective, cross-sectional and descriptive study developed in a public hospital that is a reference in onco-gynecology.

The sample used by the study consisted of medical records of women over 60 years of age, treated at the onco-gynecology service of a reference hospital with alterations in the oncotic Pap smear test, in the period between May 2017 and May 2019. Among the inclusion criteria, medical records of women aged 60 years or older with changes in the CCO were included, associated with

complete information recorded in the medical records about diagnosis and therapeutic approach, in addition to regular follow-up.

Cases that do not fit the inclusion criteria mentioned above, or that have data that are difficult to understand/interpret, in addition to reports from other health services, were excluded.

Data collection was carried out using a structured instrument, applied directly to the subjects' medical records and to the Records Book of the onco-gynecology unit. The structured instrument was composed of closed questions, divided into two parts. The first part of the instrument included sociodemographic data, and the second part included aspects related to the diagnosis, therapeutic proposal and clinical/surgical follow-up of the patient.

The data were treated through grouping in a database and analyzed by means of simple statistical analysis in relative and absolute numbers.

The construction of the database was done using the Excel platform of the Office 365 package and the data analysis was carried out using the statistical program SPSS, version 20.0.

The analysis had a descriptive and exploratory format of the data obtained, considering the presentation of frequency tables to describe the study population, initially characterizing the profile of the elderly women according to age group, marital status, education followed by the analysis of the most incident histological types and approaches proposed to the study population.

RESULTS

The initial sample, after applying the inclusion criteria, was composed of the medical records of 245 women, however, after applying the exclusion criteria, a final N of 202 patient records was obtained.

The profile of the analyzed population presented a mean age of 67.6 years with a median of 67 years; the 65-year-old fashion and the standard deviation of 4.59.

Marital status was predominantly represented by married women (29.63%), followed by widows (17.28%) and those who called themselves single corresponded to 16.67% of the sample.

Of the total number of medical records selected, the initial approach in 100% of the sample was to perform a new cytological analysis in the onco-gynecology unit, with altered results in 138 (68.65%) of the patients and 64 (31.34%) results did not present any significant alteration.

Among the main alterations found are atypia of undetermined significance in 42.6% of the samples, low-grade squamous intraepithelial lesions (LSIL) in 24.5% and results of severe atypia (high-grade intraepithelial lesion - HSIL, carcinoma in situ - AIS and invasive carcinoma - AC) were present in 31.7%.

Among the results of severe atypia (HSIL, AIS and CA) present in 64 of the 202 medical records analyzed, it is possible to see that the incidence of high-grade intraepithelial lesion was 16.83% (33/202), carcinoma in situ in 2.97% (5/202) and 13.36% (26/202) of invasive carcinoma.

The analysis carried out with the variables change in OCC and mean age of the affected group, it was apprehended that, among the portion of the sample that had adenocarcinoma in situ as a finding, the mean age of the affected elderly women was 70.2 years. Invasive carcinoma was present mainly among elderly women with a mean age of 68.4 years. HSIL lesions were present in the mean age of 65.5 years among those affected. LSIL alterations, on the other hand, were more prevalent with a mean age of 66.5.

Indeterminate results comprised 42.6% of the sample, with ASCUS/AGUS present in 18.1% of the sample analyzed with a mean age of 66.9 and ASC-H 24.6% with a mean age of 68 years.

When related to the variables change in OCC and marital status, it was possible to notice that 16.6% of the women with altered reports were designated single, followed by widows (17.2%) and 36.4% did not define marital status. Among the married women, 29.6% had an alteration in the CCO, with a p-value of less than 0.05, which can be characterized in this study as a factor associated with cervical injury.

Regarding the management carried out in the face of the alteration in oncotic Pap smear, active management was chosen in the face of the condition in 71%, among these, with the performance of LEEP and Conization being the most performed approaches. Conservative management, i.e., six-monthly follow-up with Pap smear, was performed in 29% of the sample.

CONCLUSION

According to the criteria of the World Health Organization, the collection of oncotic Pap smear should be completed at the age of 64, if the woman has a previous OCC without alterations.

However, in our study, the profile presented by the women was of an average age of 67 years and marital status predominantly married. Thus, despite the recommendation of the Ministry of Health, it is possible to see that this age group is prone to developing cervical cancer. Thus, the greater coverage of cervical cancer screening in this group, as well as the educational work to raise awareness of the use of barrier methods regardless of marital status, would compose effective strategies against cervical cancer, since a larger portion of our sample was composed of married women or women in a stable union.

We know that OCC performed in elderly women should be preceded by preparation in order to avoid misinterpretations and erroneous findings related to the interiorization of the columnar scale junction. This is reflected in the number of false-positive results found after a second cytological evaluation.

This factor is relevant since it burdens a specialized service and often delays the capture of patients with real care needs.

It was possible to perceive a relationship between high-grade lesions, AIS and IC in older and married women, leading us to infer that greater exposure to HPV contagion mechanisms at advanced ages is related to the development of pre-invasive lesions. Regarding this point, the literature shows that, after the age of 56, women are more predisposed to develop high-risk lesions when compared to young women, and the persistence of exposure to high-risk HPV associated with deficient screening of this group, combined with late diagnosis, may be related to the invasive and malignant potential of the disease.

Thus, when diagnosed late, these elderly women required active management, which was demonstrated by the high rate of this approach in the study.

In view of these analyses, it is possible to conclude that the changes in the sexual patterns of elderly women today reflect a need to readjust these parameters, the understanding of the need to implement a broader screening policy, in view of the comprehensive care policy, with better definitions for the gynecological health of elderly women.

Reducing morbidity/mortality of elderly women due to cervical cancer is a health goal yet to be achieved. Currently, the epidemiological picture of these neoplasms continues to maintain a significant position in the female group, and has been reflected in an increase in incidence in elderly women. This study demonstrates the high rate of severe atypia admitted late to a referral service for onco-gynecology, which may demonstrate flaws in the traceability process of cervical cancer in this population. It is possible to perceive the need to review policies aimed at this population not only to prevent mortality, but also to combat morbidity and ensure a healthy life for women in old age.

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Reflections on Christopher Alexander's principles as a basis for good practices in urban analysis

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Fernando dos Santos Calvetti[1]

ABSTRACT

This article reflects on the relevance of Christopher Alexander's discourse for current urban analysis, largely based on the computational power of modeling urban configuration and dynamics. Configurational analysis of cities is an essential approach to understanding and improving the way urban spaces develop and function. Among the infinite possibilities of analysis of this complex and constantly changing object, the use of mathematical instruments and models that seek to simulate urban relations and dynamics has gained more and more traction in academia, especially in the forms of configurational studies and urban syntax. In the meantime, Christopher Alexander is recognized for his innovative contributions to the understanding of urban form and its relationship with the flows that occur in the city. Alexander's approach is also fundamental for configurational analysis, as it offers a robust theoretical framework to understand how urban elements connect and interact in a functional and harmonious way. It emphasizes the importance of an urban structure that is adaptable, organic, and able to evolve over time to better serve the communities that live in it. This holistic and humanized vision of urbanism is crucial to address the contemporary challenges of cities.

Keywords: Christopher Alexander, Configurational studies, Urban analysis.

[1] Adjunct Professor at the Department of Architecture and Urbanism at the State University of Santa Catarina (UDESC)

INTRODUCTION

This text, of a reflective nature, discusses the relevance of Christopher Alexander's thought in the architectural present. Christopher Alexander's theories on urban analysis and design have for more than sixty years impacted architectural and urban theory in different contexts. His methodological proposals for the search for rational algorithms in the understanding and production of space become, as artificial intelligence and the digital interface become increasingly present in our praxis, increasingly current and pertinent to the understanding of our instrumental possibilities and limitations.

His seminal work, "A Pattern Language," for example, provides a comprehensive guide to understanding and designing urban spaces, emphasizing the organic and evolving nature of cities, in contrast to more rigid and mechanistic planning models. Christopher Alexander's theories on urban analysis and design constitute an interesting lens for understanding the dynamics and development of cities.

THEORETICAL FOUNDATIONS

Alexander starts from the premise that urban spaces should grow and adapt organically, in a similar way to living organisms. This core concept is expressed through "patterns," which are recurring solutions to common problems in the built environment. Each pattern is a template that can be repeated over and over again, without the solution becoming identical with each repetition.

Alexander proposes that the city should not be a conglomeration of prefabricated elements, but rather a growing organism, guided by design principles such as differentiation and adaptation. This vision implies that the urban structure must emerge from a step-by-step development process, in which small projects and one-off developments contribute to a more coherent whole. This process is analogous to cell division, where smaller structures differentiate and adapt to form a larger, more complex structure.

One of Alexander's most impactful concepts is "nameless quality", a characteristic resulting from the applications of the hierarchically most important constraints in his theory, and therefore essential for the creation of livable and pleasant spaces according to his way of designing. He argues that this quality emerges when standards are applied correctly, creating a harmonious and functional environment. In "The Timeless Way of Building," the sister half of A Language of Patterns, Alexander explores how this quality can be achieved through design that respects the natural and social forces that shape urban spaces.

His approach, paradoxically rational and holistic, offers an alternative to traditional urban planning methodologies, which often fail to consider the complexity and interconnectedness of the elements that make up a city. Alexander's vision is particularly relevant at a time when many cities

face significant challenges related to disorderly growth, social fragmentation, and environmental sustainability.

In this context, the use of Geographic Information Systems (GIS) in urban analysis has been one of the areas in which Alexander's ideas have been successfully applied. The ability to map and analyze spatial patterns allows urban planners to identify areas of intervention and develop strategies that promote more coherent and sustainable urban growth. For example, the identification of morphological patterns in medium and large cities, which have greater possibilities for up-to-date databases, can reveal valuable insights into how the dynamics of urban sprawl impact public transport planning and the distribution of land uses.

Although Alexander's work has been widely influential, it is also the subject of criticism and revision. In recent decades, researchers and urban theorists have explored both new ways of applying and expanding their ideas and alternatives to them. A significant example is the adaptation of their concepts to the analysis of living structures in urban environments, as discussed by Jiang and Huang (2021). They propose an approach that integrates Alexander's principles with contemporary spatial science, creating analytical tools that capture the complexity and hierarchy of urban structures with the aid of programming languages.

The adaptation of Alexandrian thought in contemporary times is consistent with the necessary constant reflection on its pertinence and applicability. Alexander himself revised his theory over time. Initially, he focused on specific patterns to solve recurring problems in the built environment. However, in his later works, such as "The Nature of Order," he developed the idea of "centers" and their transformations, arguing that the beauty and functionality of spaces emerge from the dynamic interaction of these centers. This theoretical evolution reflects an attempt to integrate a deeper understanding of geometry and complexity into urban design processes. There is, therefore, the possibility of understanding that with maturity, the author recognizes the limitations of an extreme rationality when dealing with the city, a complex and incomplete object by definition.

Thus, it is understood today that the practical application of Alexander's theories can be observed in urban design and architecture projects that prioritize the harmonious integration of built and natural elements. For example, the Oregon experiment, described in "The Oregon Experiment," exemplifies how its ideas can be implemented on a large scale, while allowing for one-off interventions and incremental developments. This participatory and adaptive planning model has been used in several cities around the world to promote more sustainable and humane urban development.

Another example is the implementation of design patterns that promote connectivity and accessibility, as initially suggested by Freeman (1977) and Krafta (1994), who spearhead research and lines of configurational thought in the search for the recognition of urban patterns.

Configurational analysis of road networks and public spaces can help identify areas of high centrality and polarity, informing planning decisions that improve the efficiency of public transport and the quality of life of inhabitants.

FINAL THOUGHTS

Christopher Alexander's theories continue to be a vital source of inspiration and guidance for urban planners, architects, and researchers. Its emphasis on creating urban spaces that are both functional and aesthetically pleasing resonates with the contemporary need to develop more sustainable and livable cities. By integrating their ideas with modern technologies and analytical approaches, such as GIS, it is possible to advance the understanding and management of urban dynamics in a more effective and holistic way.

In conclusion, the relevance of Alexander's theories transcends simple practical application; They offer a philosophical and methodological vision that challenges traditional approaches to urban planning. By focusing on the adaptation and organic evolution of urban spaces, Alexander provides us with a framework to create cities that not only meet the functional needs of their inhabitants but also enrich their daily lives with beauty and harmony.

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Public cost management in the Department of Health: A comparative study before and after Covid in a small municipality

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Euselia Paveglio Vieira[1] and Inara Caroline e Lima Mastella[2]

ABSTRACT

Including an internal policy in relation to cost management allows the manager to adopt effective strategies, including in the public sector. Thus, the present study aims to analyze the costs of the Health Department of a small municipality in order to enhance the use of resources in different scenarios. Thus, the study has as a basic question to identify the contribution of cost indicators in the management of the resources of the Health Department of a small municipality, including in times of pandemic crises. For data collection, interviews were conducted in a non-structured way, using a pre-defined agenda, with observation to identify the structure and functioning of the Secretariat, in addition to the use of accounting and health reports with physical-financial data. Therefore, based on the collection of information, it was possible to map the Secretariat's processes, determine the transfers and the allocation of resources to the respective activities, identifying the differences before and after Covid-19, the average revenue and expenditure per capita. It is found that cost management in the public sector needs more attention and that its importance stems from the need for efficiency in public administration, and management indicators help in decision making.

Keywords: Management, Public Costs, Indicators, Efficiency, Health.

[1] Highest degree: PhD in Administration UFMS
Academic institution: Professor UNIJUI - Regional University of the Northwest of the State of RS
ORCID: https://orcid.org/0000-0001-5927-2703
[2] Highest Degree of Education: Bachelor of Science in Accounting
Academic institution: UNIJUI - Regional University of the Northwest of the State of RS
ORCID: 0009-0005-2427-4326

INTRODUCTION

Cost management plays a fundamental role in organizations, due to the interconnection of markets with globalization, which consequently requires managers to have a good internal policy in relation to costs. According to Martins (2018), cost accounting for planning and control serves to determine models and budgets, which are fundamental in the forecast and subsequent analysis of the results obtained.

With a similar bias, in the public sector, having structured cost accounting also gives the manager the planning of actions. However, because it is a public entity, and thus with a different corporate purpose from other organizations, the cost system contributes beyond this panorama, that is, it makes it possible to know how the expenditure of public resources occurs, in order to avoid distortions and inefficiency in its use. In this context, Mauss & Souza (2020) clarify that the cost statement serves to support decisions to outsource or not public services, suppress expenses and identify the need to replace inefficient equipment, that is, it supports decision-making with a view to the best economic result.

The Coronavirus (Covid-19) pandemic caused a series of immediate changes in management, specifically in public health, which was exposed due to the significant increase in the demand for resources. Given this scenario, having control of expenses has become essential to have assertiveness of actions, since financial resources are scarce.

From this perspective, the study has as its central question to understand how cost indicators can contribute to the management of the resources of the Health Department of a small municipality, including in times of pandemic crises? Therefore, the objective is to analyze the costs of the Health Department of a small municipality in order to enhance the use of resources and the respective control in different scenarios.

Thus, it is emphasized that even after 21 years of the enactment of the Fiscal Responsibility Law - LRF, which requires the institution of a cost system in the Public Administration, it has not yet been established in practice, therefore, it is justified to carry out the study, which also aims to contribute in times of crisis such as the Covid-19 pandemic.

It should be noted that the choice of the Municipality occurred as a result of the fact that, in 2020, it ranked 3rd in the classification of the best accounting information in the country, according to SICONF – Accounting and Tax Information System of the Brazilian Public Sector.

THEORETICAL FRAMEWORK

Accounting at the head of organizations stands out because it is inserted in the management process in its various areas of knowledge. Thus, public accounting is one of the segments of Accounting Science, being closely related to the function performed by the State before society.

What underpins the activities of the State is the preponderance of the collective interest that prevails over the private interest, so the entire institution of public law dictates supervises this pillar (Nohara, 2020).

In order for public service to occur, there is public administration, which consists of the technical and structural apparatus, being divided into direct and indirect administration (Arruda and Paixão, 2020). The direct Public Administration is arranged with a hierarchy of power, which means that the departments have delimitation in their attributions, therefore, they form a chain structure with submission between the sectors (Kohama, 2016).

Cost accounting, on the other hand, has undergone evolution, and initially its objective was to determine the cost of industrial products and later it became a tool for measurement and management control (Padoveze, 2015). In the public sphere, cost accounting has its most timid trials than in relation to private organizations, pointed out by Mauss and Souza (2020), that there are even laws that deal with the subject, but that do not support how to actually implement it.

Thus, it is also important to understand their role in relation to public administrations. And, in this sense, Lima (2018) points out that the effective identification of costs allows society to control the quality of public activities. In this way, the establishment of the system of costs applied to the public sector grants managers and society parameters to analyze the results of the acts practiced by the federative entities.

Therefore, Mauss and Souza (2020) allude that through the measurement and management of costs, the administrator is able to know the value of each service and thus have subsidies to conduct the government in a more conducive way. Regarding the insertion of cost accounting in the public sphere, some laws have been drafted, and they will be presented in the course of the year. From this point on, the approach begins with Law 4.320/1964, which is the basis of all legal systems that surround public accounting. This important law states that industrial services must keep their costs in keeping records in addition to the patrimonial and financial records (Brasil, 1964).

In the field of action of the organization of the Federal Administration, Decree-Law No. 200/1967, in its article 79, is responsible for accounting as to the disclosure of costs in a way that makes it possible to conceive their effects. And with regard to personnel administration, the legislation emphasizes that mechanisms for evaluation must be established that subject the public sector to levels existing in the private sector, in such a way that costs do not overlap in an unsustainable way (Brasil, 1967).

With a subsequent edition, Decree No. 93,872/1986 once again reinforces the importance of financial control through cost management at the federal level, ratifying article 79 of Decree-Law No. 200/1967, and adding more information (Brasil, 1986). Likewise, Mauss and Souza (2020) point

out that the Federal Constitution imposes that the activities developed by federative entities occur in line with the principle of economy, thus, it is strictly linked to informational cost management.

In addition, reinforcing the accounting obligation to manage public sector costs, Law 10.180/2001, which deals with federal planning and budget systems, also emerges that the accounting system must record and evidence "the costs of the programs and units of the Federal Public Administration" (Brasil, 2001). It also points to the control of costs when contracts are signed with the remittance of resources, highlighting that prior appraisal must take place "so that the amount of resources involved in the operation is compatible with its object" (Brasil, 2001).

Therefore, the reflection of the advent of the LRF, published in 2000, which brought more severe impositions to the public administration, triggering a rupture of what had been until now in levels of control, and consequently held more accountable the acts of public administration (Mauss & Souza, 2020). Therefore, seeing that the public sector still lacked information for government management, the matter on costs is brought in the LRF, in its article 50, § 3 with the following text: "the Public Administration shall maintain a cost system that allows the evaluation and monitoring of budgetary, financial and asset management" (Brasil, 2000).

According to Monteiro and Pinho (2017), as much as Law No. 4,320/64 already covered the disclosure of costs by accounting, there was a lack of depth on the subject, so they understand that the LRF brought a greater openness on the subject. Within the scope of the Federal Government, it is where the greatest improvements in the matter can be noted, according to the cost booklet of the federal administration, Ruling No. 1078/2004 of the Federal Court of Accounts, obliges the federal public administration to implement a cost system that "allows, among others, the evaluation and monitoring of the budgetary and financial management of those responsible" (Brasil, 2012, p. 37).

And, also according to the booklet, the next steps were, in 2005, the appointment of the Interministerial Commission, which proposed to the National Treasury Secretariat - STN the preparation of studies with the purpose of creating the cost system; in 2008, the Technical Chamber of Expenditure Quality (CTQG) was formalized; in 2009, Decree No. 6,944/2009 (later revoked) was issued, which points to the need to improve the federal administration; in 2010, the Federal Government's cost system was approved by its agencies; and finally, in 2011, the Federal Government's cost system was implemented, being regulated by ordinances 157 and 716 of the National Treasury Secretariat (Brasil, 2012).

This result is caused by the successive disruptions present in the public sector, therefore, another milestone that demonstrates great effects is the process of convergence of accounting standards, according to Mauss and Souza (2020), they were edited in 2008 and with subsequent changes, but they are not yet overcome by employees in the accounting area. With this, it is evident that public agencies run into slowness, because, as has been exposed, there are laws that address the

subject, but, however, as stated by Mauss and Souza (2020, p. 14) "practice has shown that public entities that have adopted cost systems have not done so in a conceptually well-structured way. [...] even so, [...] it has already made it possible to obtain more positive results [...]".

It should be noted that the main guide for structuring the cost system comes from NBC T 16.11, which specifically addresses the subject. With regard to the appropriation of costs, it can occur in the following ways: direct costing; variable costing; absorption costing; activity costing; and full costing (Mauss & Souza, 2020). Thus, regarding continuous production, NBC T 16.11 conceptualizes that this system consists of producing demands of a continuous nature, and when it is by production on demand, it refers to the service or product demanded, applied more when related to works and improvements (CFC, 2011).

To define the costing system, Mauss and Souza (2020) mention that the predetermination of costs is focused on management, serving as an analysis tool, as they are the target cost (estimated) and the standard cost, which are used in the planning of the PPA, LDO and LOA and in the appreciation of the results. The target cost or estimated cost refers to the projected cost with a bias to support the development of budgets (CFC, 2011). And, according to Martins (2018, p. 297), the standard cost "is often understood as the Ideal Cost of production of a particular good or service".

With regard to costing methods, that is, the form of appropriation of costs is presented in sequence for each existing type, and at first direct costing is conceptualized, which is the method by which all variable or fixed costs are used without apportionment, excluding indirect costs not related to the good or service (Mauss & Souza, 2020).

While in variable costing, according to Viceconti and Neves (2018), as its name suggests, variable costs are used, disregarding fixed costs, which are recorded with the expenses of the period, however, it conflicts with accounting principles, therefore, its usefulness is for managerial purposes. In turn, Martins (2018, p. 22) conceptualizes absorption costing as "the method derived from the application of Generally Accepted Accounting Principles [...]. It consists of the appropriation of all production costs to the goods manufactured [...]".

Regarding full costing, NBC T 16.11 mentions that expenses with products and services are included in the calculation together with costs (CFC, 2011). Regarding costing by activity, Mauss and Souza (2020) state that this model is the most complex, because it requires the detailing of the processes that encompass a certain product. Corroborating, Martins (2018) points out that ABC costing has its origin in reducing the inference of cost allocation, in addition to being a tool for cost management.

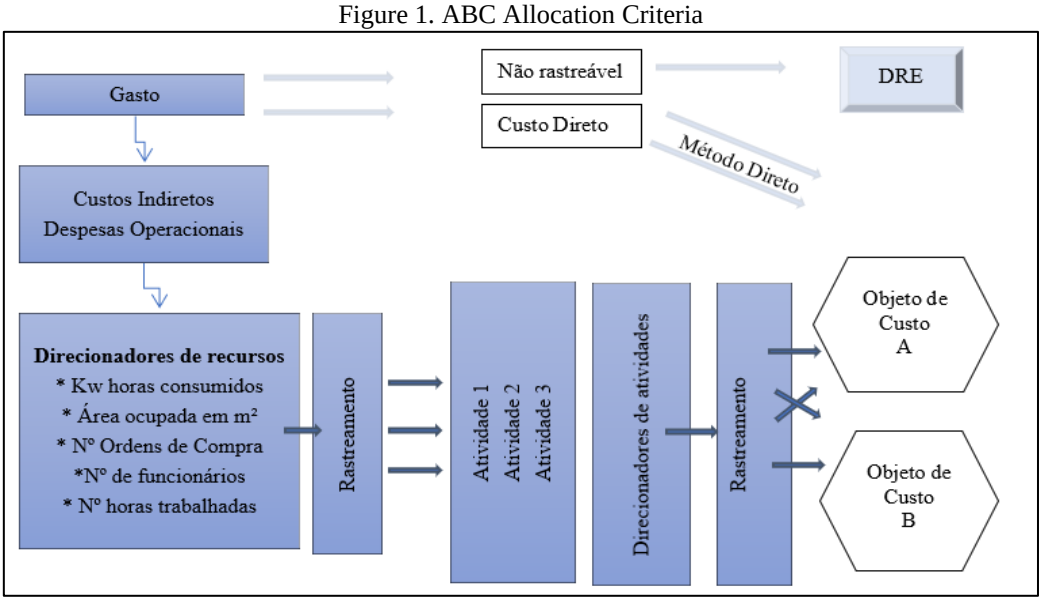
Regarding the best costing method, several authors claim that the ABC is capable of satisfying the needs of the public sector. Thus, one of the first defenders and scholars who addressed the subject was Alonso (1999), who emphasized that ABC costing meets the requirements for the

implementation of a cost system of public administration, firstly, due to the structure that composes it, which contributes to the elaboration of cost centers and the high fixed and indirect costs, which make it difficult to use an appropriate method for apportionment.

Martins (2018, p. 279) also positions himself in favor of activity-based costing, stating that "it is possible to use the ABC in financial institutions, public service concessionaires [...], hospitals, schools, etc. In short, activity and costing objects are found in all organizations, including non-profit ones". And more contemporaneously, Mauss and Souza (2020) also point to ABC costing as the most appropriate method for use in the public sector, due to the *mix* of services and the mistakes that apportionment procedures can cause in other methods.

Therefore, in order to use this method to calculate costs, there are other elements that need attention, thus, Martins (2018, p. 83), brings the concept of activity for identification purposes in ABC costing, which "is composed of a set of tasks necessary for its performance". In addition to mapping activities, cost drivers are used, which have the ability to link costs to your activities. In this way, Mauss and Souza (2020, p. 55), ratify that "in the first stage, called "costing of activities", the costs (resources consumed) are directed to the activities. In the second stage, called "object costing", the costs of the activities are attributed to products, services and customers". In order to elucidate the functioning of the ABC, figure 1 is presented, which represents the allocation mechanism.

Figure 1. ABC Allocation Criteria



Source: Mauss and Souza (2020, p. 59).

As shown in figure 1, the expenses composed of indirect costs and operating expenses go through the drivers, which are tracked by activities until they reach the cost object, the expenses that are not traceable go to the P&L and the direct costs are allocated to the objects.

METHODOLOGY

Regarding the classification of research, it is of applied origin, which means that research is determined to solve feasible problems (Vergara, 2016). Regarding the objectives, the study was carried out in a descriptive and explanatory way. This fact arises because descriptive research is based on the exposition of the circumstances and aspects of the object under examination (Gil, 2019). And, as for explanatory research, it occurs because there is a need to explain the processes, therefore, it aims to elucidate the reasons that make up certain events (Vergara, 2016). As for the way of approaching the problem, it is qualitative, according to Martins and Theóphilo (2016), the descriptive predominance is a basic attribute in this type of research, and there may be the characterization of individuals and episodes, even the reproduction of narratives.

In addition, in relation to the technical procedures, it is classified as bibliographic, documentary and case study. According to Marconi and Lakatos (2021, p. 49), the bibliographic research "[...] It is made based on texts, such as books, scientific articles, critical essays, dictionaries, encyclopedias, newspapers, magazines, reviews, summaries.

With regard to the documentary study, it is based on documents for the collection of information, using primary sources (Martins & Theóphilo, 2016), that is, data was extracted from the original documents, which were not subject to examination and which this in turn is up to the author to carry out, thus, in the study, information was collected through accounting reports, service reports, procedures performed at the secretariat and other possible documents available at the Health Secretariat.

Finally, the research is also classified as a case study, because it is the investigation of the facts with the indication of prognosis (Gil, 2019). It is also characterized by a broad analysis of an event, which in turn requires the researcher to use several sources, including: document analysis, observation, and interviews (Gil, 2019). Therefore, such concepts justify the classification because the research was carried out in the Health Department of a small municipality in the Northwest of the State of Rio Grande do Sul.

ANALYSIS OF THE RESULTS

This chapter results from the collection and analysis of data, which includes the examination of the results obtained. Therefore, the amounts of revenues and expenses for the years 2019, 2020 and from January to July 2021 were calculated.

COMPARISON BETWEEN REVENUES AND COSTS BEFORE AND AFTER THE PANDEMIC

This topic contains the analysis of the data collected, with the confrontation of the information, making a cut of important elements, with this in chart 1 there are the impacts generated in the main revenues in the study period.

Table 1. Impacts on revenues

Year	**2019**	**2020**	**2021 (Jan/Jul)**
Source of Funds	**Recipes**	**Recipes**	**Recipes**
ASPS – Public health actions and services	2.124.370,03	2.194.435,73	1.647.867,59
FUNDING - Other programs financed by fund-to-fund transfers	0,00	271.388,60	1.129,12
Primary Care – PIES	36.030,64	89.623,80	37.821,54
Basic Pharmacy / Medicinal Plants and Herbal Medicines / Diabetes Mellitus / Diapers and other supplies	3.956,61	7.907,91	3.733,65
PSF / Oral Health / PACS	30.055,52	97.671,40	40.090,87
Other municipal revenues applied in Health	0,00	30.663,18	21,75
Total collection in the periods	**2.701.536,67**	**3.243.809,27**	**1.990.024,76**

Source: Accounting report (2021)

In analysis, an increase of 3.30% in ASPS revenues is identified, from 2019 to the year 2020, in percentage it is not so representative, but as this is one of the main sources of revenue, it makes it reach the amount of R$ 70,065.70 in value. Among all the main contributions, it can be seen that in 2020, there was the implementation of costing values (fund to fund), which did not exist in 2019, this amount originates from the transfer of resources from the union, making a total of R$ 271,388.60, however, in relation to the year 2021, a reduction in the amount transferred is identified.

Primary care-PIES, a state resource, had an increase of 59.80%, doubling the amount transferred in 2020 compared to 2019, and until July 2021, the revenue has also exceeded the amount transferred in 2019. The amount transferred to the basic pharmacy doubled from 2019 to 2020, and in 2021, until July, it had almost reached the total collected in 2019, to equalize with the same amount as last year, 52.79% is still missing.

Of the amount transferred from the State of PSF / Oral Health / PACS, in 2021 it has already exceeded the resource received in 2019 by 33.38%, and compared to the year 2020 the result is different, because there is still 58.96% to reach the same amount, which means that the collection of 2021 corresponds to only 41.04% of the year 2020. Through this, it is identified that the year 2020 proved to be much higher than the other two years, since in relation to 2019 the amount received more than tripled.

Also, it is noted that the municipality, in 2020, had a contribution of resources classified as other municipal revenues applied to health, which are resources originating from Complementary Law 173/2020, which, in addition to stipulating other regulations, allocated resources to States and Municipalities. Like revenues, table 2 presents the impacts generated in expenses.

Table 2. Impacts on expenses

GENERAL ADMINISTRATION	2019	2020	2021 (jan/jul)
Total of the subfunction in the periods	**180.413,37**	**455.685,82**	**203.598,46**
Main expenses that impacted	**2019**	**2020**	**2021 (jan/jul)**
3.1.90.04 - Fixed-term hiring	0,00	58.578,92	60.587,18
3.1.90.11 - Fixed salaries and benefits - civilian staff	141.234,82	173.367,01	97.212,67
3.1.90.13 - Employers' obligations	32.826,98	54.683,52	18.070,22
3.3.90.30 - Consumables	837,90	32.601,30	25.447,35
4.4.90.52 - Equipment and permanent material	0,00	100.480,00	0,00
PRIMARY CARE	**2019**	**2020**	**2021 (jan/jul)**
Total of the subfunction in the periods	**2.720.021,39**	**2.339.541,45**	**1.216.534,24**
Main expenses that impacted	**2019**	**2020**	**2021 (jan/jul)**
3.1.90.04 - Fixed-term hiring	185.914,71	276.707,55	210.794,83
3.3.93.39 - Other third-party services - PJ	441.590,56	0,00	0,00
HOSPITAL AND OUTPATIENT CARE	**2019**	**2020**	**2021 (jan/jul)**
Total of the subfunction in the periods	**119.402,32**	**549.680,33**	**317.259,28**
Main expenses that impacted	**2019**	**2020**	**2021 (jan/jul)**
3.3.93.39 - Other third-party services - PJ	0,00	417.432,73	182.541,26
PROPHYLACTIC AND THERAPEUTIC SUPPORT	**2019**	**2020**	**2021 (jan/jul)**
Total of the subfunction in the periods	**310.048,12**	**438.757,55**	**217.572,16**
Main expenses that impacted	**2019**	**2020**	**2021 (jan/jul)**
3.3.90.32 - Free material, goods or services	972,98	57.931,27	20.109,10
3.3.90.39 - Other third-party services - legal entity	4.400,00	17.160,00	12.373,44
3.3.93.32 - Material, goods or serv. For free distr	226.106,91	291.504,94	145.389,89
HEALTH SURVEILLANCE	**2019**	**2020**	**2021 (jan/jul)**
Total of the subfunction in the periods	**145.995,95**	**151.149,83**	**83.573,29**
EPIDEMIOLOGICAL SURVEILLANCE	**2019**	**2020**	**2021 (jan/jul)**
Total of the subfunction in the periods	**32.339,44**	**25.668,66**	**4.402,99**
Main expenses that impacted	**2019**	**2020**	**2021 (jan/jul)**
3.3.90.30 - Consumables	27.989,35	21.212,65	4.402,99
Grand total of expenses in the periods	**3.508.220,59**	**3.960.483,64**	**2.042.940,42**

Source: Expense balance sheet (2021).

At this point, it is identified that spending on the general administration subfunction implied, compared to 2019, an increase of 152.58% and 12.85%, respectively in 2020 and 2021. This was caused by the increase in accounting with fixed-term hiring, and in 2019 there were no expenses in this element of expense, so in 2020 around 58 thousand reais were spent, and in 7 months of 2021 it has already exceeded this amount. There was also an increase in salaries and fixed benefits in 2020, as well as in employers' obligations, but in 2021 there is already a decrease in these expenses.

Also in this subfunction, it can be seen that there was an increase in the expenses of consumables, which, according to the expense balance sheet, correspond to the acquisition of cleaning material and hygiene products, protection and safety material, and hospital material. And finally, the most significant impact was the acquisition of a vehicle from the 2018/2019 popular consultation, in the amount of R$ 99,400.00, paid with resources from the popular consultation and with complementation of values from the sale of assets and free resources. And the difference of R$ 1,080.00 is linked to the acquisition of two digital thermometers for temperature measurement, therefore, directly linked to the fight against the pandemic.

In the primary care subfunction, there was a decrease in total expenditures, and the main effect is the reallocation of expenses with the application modality 93, which corresponds to the use of resources in a public consortium, which refer to the provision of medical-hospital, dental, and laboratory services, and as of 2020 they became part of the hospital and outpatient care subfunction.

In addition, another element calculated was the overspending of R$ 90,792.84 in fixed-term hiring, from 2020 to 2019, that is, it had an increase of 48.84%, while the value calculated in 2021 also exceeded the value of 2019, but by 13.38%. With regard to the prophylactic and therapeutic support subfunction, the elements of expenses that had an impact on the difference between the years were material, good or service for free distribution, both of direct application and acquired by the consortium, and the contracting of other services from third parties - legal entities.

And as for the surveillance subfunctions had a decrease, the sanitary with a smaller variation between the years, but the epidemiological in 2021 had a reduction of 86.39% compared to 2019 and 82.85% in 2020, even though the analysis period does not refer to the entire year, it is seen that these expenses are well below what was done in previous years.

Chart 3 culminated in the identification carried out in the expense balance sheet, with the intention of finalizing the analysis of the behavior of expenses, therefore, it elucidates the actions aimed exclusively at combating the coronavirus by subfunction.

Table 3. Expenses in actions to control and combat Covid-19

Subfunction/Program/Action	2020	2021
General administration	**123.884,75**	**86.034,53**
Citizen health care		
Actions to control and combat Covid - 19		
Primary care	**29.606,92**	**46.884,01**
Citizen health care		
Actions to control and combat Covid – 19		
Hospital and outpatient care	**1.443,74**	**60.903,92**
Citizen health care		
Actions to control and combat Covid – 19		
Prophylactic and therapeutic support	**22.832,98**	**11.343,70**
Control and distribution of medication		
Actions to control and combat Covid - 19		
Epidemiological Surveillance	**7.257,50**	**4.191,14**
Health surveillance		
Actions to control and combat Covid – 19 in schools		
Grand total	**185.025,89**	**209.357,30**

Source: Expense Balance Sheet (2021)

This table alludes that the total amount spent in the year 2020, which can be directly identified with the pandemic, reaches the amount of 185 thousand reais, which is lower than the amount spent until July 2021. It is also reported that the total amount of 60 thousand reais was

transferred to the reference hospitals in care in the region, of which the municipality is part, through a subsidy, being allocated to hospital and outpatient care.

And in order to have a parameter of the average resources and expenditures on health, chart 4 was elaborated, based on the population, according to data obtained from the IBGE. However, it should be noted that for the year 2021, it was necessary to make a projection, as the year is still ongoing. In this way, the amounts of income and expenses were divided by 7 and multiplied by 12 months.

Table 4. Average health income and expenditure per capita

Description/Year	**2019**	**2020**	**2021 (projection)**
Average Revenue *Per Capita*	1.279,74	1.536,62	1.616,05
Average expenditure *per capita*	1.661,88	1.876,12	1.659,02
R-D Difference	(382,14)	(339,50)	(42,97)
D/R Ratio	129,86%	122,09%	102,66%

Source: Expense balance sheet (2021) and IBGE (2020)

In this survey, it is noted that the average revenue and expenditure increased between the years, although the scenario was slightly different in 2021 when compared to 2020 in relation to expenses.

Regarding the values identified in table 4, it is informed that according to the data obtained from SIOPS, the expenditure values for 2019 are R$ 1,657.74 (SIOPS) and in 2020 R$ 1,873.34 (SIOPS), demonstrating the proximity of the results obtained.

In this way, when the comparison occurs with revenues during the period alluded to, it can be seen that the growth from 2019 to 2020 was 20%, from 2020 to 2021 it was 5%, that is, confirming the projection there will be growth, but in a smaller proportion. When the same analysis of expenses is carried out, it is seen that from 2019 to 2020 the increase was 13%, a percentage lower than revenues, and from 2020 to 2021 a decrease is expected.

In addition, it is possible to determine the relationship between expenditure and revenue, and in 2019 expenses exceeded revenues by 29.86%, in 2020 the result was 22.09%, while in 2021, if this projection is confirmed, the ratio will only be 2.66%, that is, there is almost equivalence between the values.

To discuss the subject more broadly, chart 5 is presented, which contains the list of procedures performed at the UBS for the years 2019 to 2021, remembering that the latter includes the period from January to July.

Table 5. Production Summary

Description	2019	2020	2021
Individual service	8.148	6.592	4.875
Individual dental care	1.237	595	511
Collective activity	171	121	69
Food consumption markers	1	0	0
Individualized procedures	13.510	8.021	7.173
Vaccination	119	890	402
Home and territorial visits	17.534	4.968	1.388
Total production	**40.720**	**21.187**	**14.418**

Source: e-SUS Report (2021)

Table 5 presents the compilation of the data contained in the e-SUS report and according to information passed on by the Health Department, the vaccination data do not reflect the totality of the vaccines applied in the years 2019 and 2020, due to the non-mandatory insertion of the information in the aforementioned system.

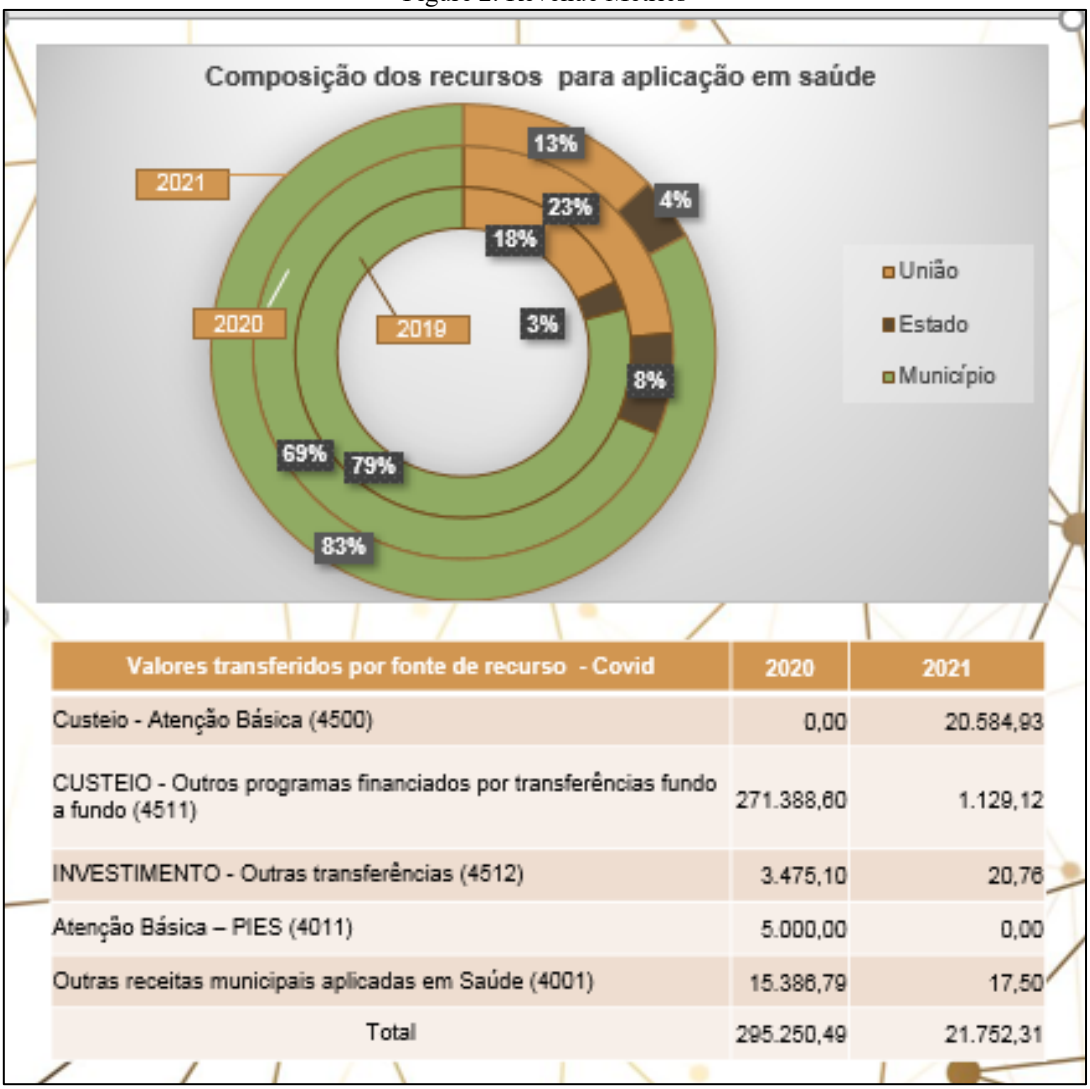
And about individualized care, according to the words of the administrative agent of the Health Department "there are all medical, nurse, nutrition, physiotherapy and psychology consultations".

Therefore, analyzing the data, it is found that the attendances had a sharp reduction compared to the year 2019, this is due to the pandemic, where services were reduced so that the health system was available for cases from Covid-19. Thus, there was a reduction of 47.97% in the total number of procedures performed in 2019 to 2020.

MANAGERIAL COST INDICATORS FOR DECISION

The last section comprises the main indicators that can be used for managerial purposes. In this way, it brings up a series of graphs which serve for the manager to have as a reference in decision making. Figure 2 shows how the composition of revenues for application in health is formed, that is, it shows how much the Municipality, the State and the Union spend on health.

Figure 2. Revenue Metrics



Valores transferidos por fonte de recurso - Covid	2020	2021
Custeio - Atenção Básica (4500)	0,00	20.584,93
CUSTEIO - Outros programas financiados por transferências fundo a fundo (4511)	271.388,60	1.129,12
INVESTIMENTO - Outras transferências (4512)	3.475,10	20,76
Atenção Básica – PIES (4011)	5.000,00	0,00
Outras receitas municipais aplicadas em Saúde (4001)	15.386,79	17,50
Total	295.250,49	21.752,31

Source: Trial balance by source of funds (2021)

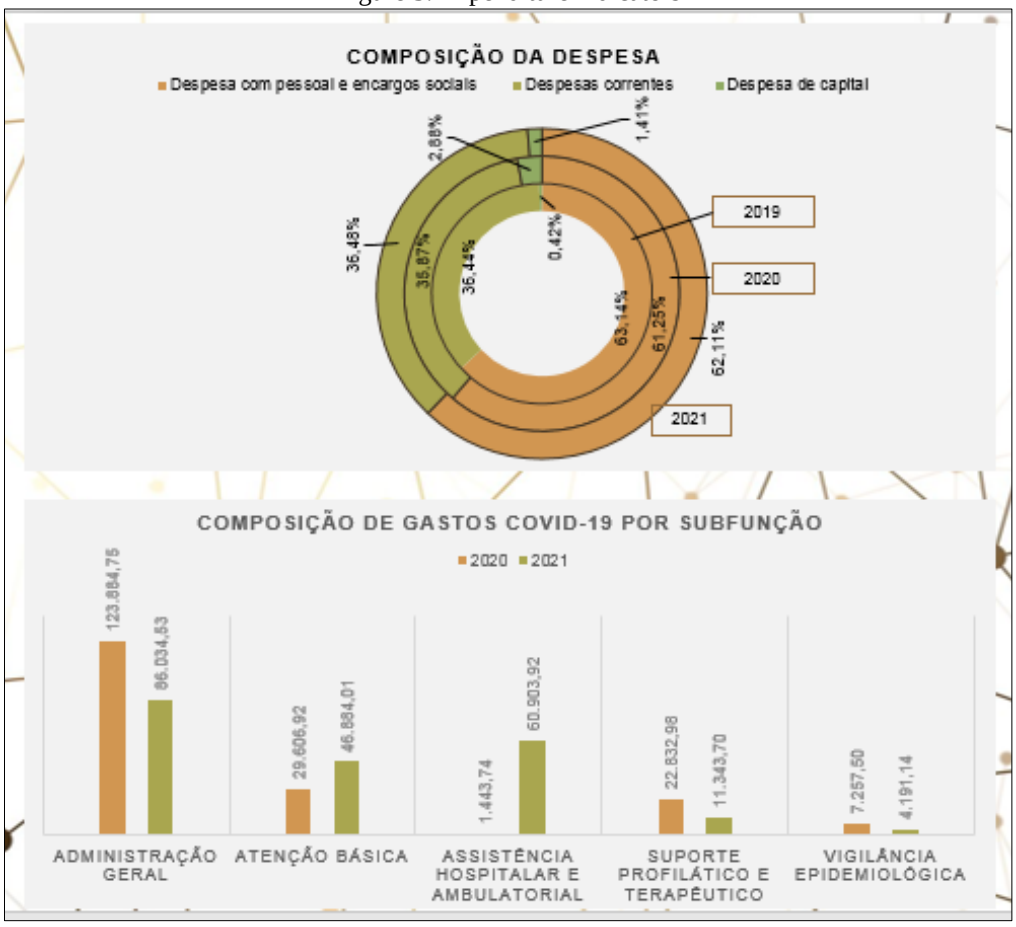
Thus, it is verified that the largest resource is the Municipality's, because it is up to it to apply its resources in health, since the main function of the basic health unit is to be the user's gateway to the health system, where it works with the reception to identify and solve the problems demanded by the patient. Thus, in the composition of resources, municipal revenues point to being above 50% in all the years analyzed, and the year that had the lowest representativeness was 2020 due to the increase in federal and state transfers. Also, it is identified that in the period analyzed from January to July 2021, own revenues reach 4% in relation to the percentage of 2019, this confirms that the values calculated in ASPS for 2021 are higher than the years 2019 and 2020.

To corroborate what was identified in the graph in figure 2, there are the transfer values for application in expenses related to Covid-19. In this way, the amount transferred to the Municipality to cover Covid expenses, almost makes up the amount of 300 thousand reais, corresponding to 9.10% of the revenue calculated in 2020 of R$ 3,243,809.27, and in relation to the executed expenditure that corresponded to 7.45%.

Regarding the amount transferred until July 2021, it is noted that it tends not to reach the values calculated during the year 2020, due to being around 22 thousand reais, in addition, according to the accountant's report "the values of investments, fund-to-fund costing, other municipal revenues applied in health, refer to revenues from the application of existing bank balances and not from transferred amounts".

State transfers peaked in 2020, as did those from the Union, and as for the composition of revenues in 2019 and 2021, it also showed similarity, which means that there were more efforts in 2020, as it interfered in the formation of resources. In relation to figure 3, the data presented correspond to the composition of the expenditure, showing the percentage spent by nature of the expenditure and the composition of the expenditure on Covid-19 by subfunction.

Figure 3. Expenditure indicators



Source: Expense Balance Sheet (2021)

In the expenditure composition chart shown in figure 3, it is identified that no significant change occurred, only capital expenditure, which are those from investments, increased in 2020 and 2021. In addition, expenses with personnel and social charges and other current expenses remained balanced.

When analyzing the composition of expenditure by subfunction related to Covid-19, it can be seen that primary care and hospital and outpatient care increased in 2021 compared to 2020. Regarding the considerable increase in hospital and outpatient care, the explanation lies in the transfers made to hospitals in the region, which totaled 60 thousand, so that it could be assisted in the care of more serious cases of Covid-19, which required hospitalization.

Thus, in this section the main data for management were presented, in order to contribute with information for possible planning actions of the public entity, given the importance of knowing the numbers behind the management.

CONCLUSION

The public sector is permeated by principles that are part of the Federal Constitution, which is the main legal norm that surrounds the Democratic Rule of Law. Therefore, it is highlighted that efficiency, one of the principles, aims to ensure that the provision of public services is carried out in a way that generates greater satisfaction of the population.

It is in this scenario that cost management is introduced in the public sector, through this tool it is possible to manage resources in a purposeful way. Furthermore, management indicators facilitate the manager in choosing actions, serving as a subsidy to adopt the best alternative in the face of the existing panorama.

In this way, the study went through some stages, identifying the activities developed before and after the pandemic, thus demonstrating the main interferences that the pandemic caused in the local public health system. Regarding the calculation of transfers and the allocation of resources for activities, tables were made with revenues by source of funds, since there are specific rules for their application, and with expenses, the existing structure was used, which consists of the division by subfunctions, data extracted from the expense balance sheets.

With this survey, it was possible to analyze the use of resources before and after Covid, identifying that there was an increase in the transfer of resources, mainly from the Union, in 2020, and that the period from January to July 2021 the increase in value was in the ASPS. With the summary of production, a decrease in the activities developed by the Health Department was visualized, with the total attendances in 2020 falling by half compared to 2019.

When comparing the values by group of nature of expenditure, there was not much change between the groups, however these data serve for the manager's analysis in a broad way how the resources are applied, because they demonstrate the amount spent on personnel, other current expenses and capital. In this way, it can be seen that more than 60% of the resources are for the payment of the servers allocated to the secretariat, including both the administrative part and the health professionals.

In the composition by subfunction, it is alluded that in order to control the use of resources for spending on Covid-19, specific controls were created, enabling the identification of expenses, and the total in 2020 was R$ 185,025.89, corresponding to 4.67% in relation to total health expenditures, and that in 2021, until July, the scenario was 10.25% compared to the total spent.

In general, the most significant expenditures from 2019 to 2020 occurred in the subfunctions: general administration; hospital and outpatient care; prophylactic and therapeutic support. Thus, in the total amount it points to an increase of 11.42% between 2019 and 2020, while the analyzed period of 2021 tends to be below the amounts spent in the previous years alluded to here.

With this, it can be identified that despite the decrease in activities, the amounts spent on health after Covid-19 increased, but without the need to directly identify the actions resulting from the prevention of the pandemic. In future studies, it can be analyzed how to use the existing accounting structure to set up the activity-based costing system, something that is plausible, which allows measuring the cost of the public service, thus expanding the contribution to decision making.

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Neonatal hearing screening in newborns of pregnant women diagnosed with syphilis

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Caroline Wunsch[1], Adriana Laybauer Silveira Unchalo[2], Cassandra Caye Anschau[3], Debora Ruttke Von Saltiél[4], Denise Saúde Kochhan[5] and Adriane Ribeiro Teixeira[6]

ABSTRACT

Introduction: Congenital Syphilis is considered a Risk Indicator for Hearing Impairment (RIHI) by the Joint Committee on Infant Hearing (JCIH), making neonates exposed to this indicator more susceptible to this problem. Objective: To analyze the results of Neonatal Hearing Screening (NHS) in neonates whose mothers were diagnosed with syphilis during pregnancy. Methods: Cross-sectional and retrospective study. The following tests were performed: Transient Evoked Otoacoustic Emissions (TOAE) and/or Automatic Brainstem Auditory Evoked Potential (AABR). Results: A total of 169 medical records of newborns were analyzed, divided into two groups: syphilis (neonates of adequately treated mothers) and syphilis requiring intermediate hospitalization (inadequately treated mothers). The mean age at the first test was 2 days, with a predominance of males. In the comparative analysis between the right and left ears, there was no significant difference between the pass/fail results, and the pass result prevailed in both ears. The AABR was the most used in the test and retest in both groups. Of the 169 neonates, 37 failed the hearing screening and 29 were retested. In the retest, three individuals in the sample remained with the altered test and only one continued the diagnostic process, initially identifying conductive hearing loss and later results considered normal in the auditory evoked potential. Conclusion: The results of the study indicate that, in the sample studied, there was no association between the maternal diagnosis of syphilis and neonatal hearing loss, although syphilis is an important indicator of risk for hearing loss.

Keywords: Syphilis, Congenital Syphilis, Neonatal Hearing Screening.

[1] Highest degree of education: Specialist in Evaluation and Rehabilitation in Orofacial Motricity and Specialist in Clinical and Hsopitalar Dysphagia
Academic institution: Federal University of Rio Grande do Sul (UFRGS)
ORCID: https://orcid.org/0000-0001-7265-5688
[2] Highest degree: Doctor of Child and Adolescent Health
Academic institution: Hospital de Clínicas de Porto Alegre (HCPA)
ORCID: https://orcid.org/0000-0003-0713-9016
[3] Highest degree of education: Specialist in Speech Therapy in Childhood
Academic institution: Hospital de Clínicas de Porto Alegre (HCPA)
ORCID: https://orcid.org/0009-0006-0959-0192
[4] Highest Degree of Education: Master of Science in Child and Adolescent Health
Academic institution: Hospital de Clínicas de Porto Alegre (HCPA)
ORCID: https://orcid.org/0000-0002-4290-6033
[5] Highest Education Degree: Audiology Specialist
Academic institution: Hospital de Clínicas de Porto Alegre (HCPA)
ORCID: https://orcid.org/0009-0004-7828-1137
[6] Highest Education Degree: PhD in Biomedical Gerontology
Academic institution: Federal University of Rio Grande do Sul and Hospital de Clínicas de Porto Alegre (HCPA)
ORCID: https://orcid.org/0000-0003-4242-1666

INTRODUCTION

Syphilis is a Sexually Transmitted Infection (STI) caused by the bacterium *Treponema Pallidum* (T. Pallidum) that is curable and exclusive to humans, which spreads through contact with infectious lesions or body fluids.(1) According to the Ministry of Health, sexually transmitted infections (STIs) are caused by viruses, bacteria, and other organisms.(2) They are transmitted mainly through sexual contact (acquired syphilis), without the use of male or female condoms, with a person who is infected and who, when not treated early, can progress to a chronic disease with irreversible long-term sequelae.(3)

The transmission of an STI can also occur through vertical transmission (congenital syphilis) to the child during pregnancy, childbirth or breastfeeding, when prevention measures are not carried out.(1) There is no vaccine against syphilis, and infection with the causative bacterium does not confer protective immunity. This means that people can be infected as many times as they are exposed to *T. pallidum.*The natural history of the disease shows an evolution that alternates periods of activity with distinct clinical, immunological, and histopathological characteristics (primary, secondary, and tertiary syphilis) and periods of latency (latent syphilis).(9)

Congenital syphilis is the result of hematogenous spread of *T. pallidum* from the infected, untreated or inadequately treated pregnant woman to the conceptus transplacentally.(4) According to the Brazilian Ministry of Health,(3) every pregnant woman should be tested twice for syphilis during prenatal care. One in the first trimester of pregnancy and the second in the third trimester. Sexual partnership should also be tested. Vertical transmission of *T. pallidum* can occur at any gestational stage or clinical stage of maternal disease and the main factors determining the likelihood of vertical transmission of *T. pallidum* are the stage of syphilis in the mother and the duration of exposure of the fetus in utero.(2) For classification purposes, congenital syphilis has two stages: early, diagnosed up to two years of age, and late, after this period.(2)

The clinical syndrome of early congenital syphilis appears up to the 2nd year of life and should be diagnosed through a careful epidemiological evaluation of the maternal situation and clinical and laboratory evaluations and imaging studies in the child.[2]The clinical syndrome of late congenital syphilis appears after the 2nd year of life. As with early congenital syphilis, the diagnosis should be established through the association of epidemiological, clinical, and laboratory criteria.[2]

According to the Ministry of Health,6 from 1998 to June 2021, 260,596 cases of congenital syphilis in children under one year of age were reported in the Notifiable Diseases Information System (SINAN), of which 115,806 (44.4%) were residents in the Southeast region, 77,686 (29.8%) in the Northeast, 30,442 (11.7%) in the South, 22,155 (8.5%) in the North, and 14,507 (5.6%) in the Midwest. Congenital syphilis is preventable when the pregnant woman infected with syphilis is treated properly.[5]

Congenital syphilis, even if asymptomatic, can cause early or late sensorineural hearing loss in neonates.[7] Sensorineural loss can compromise the structures of the inner ear, due to injuries to hair cells or the auditory nerve, reducing the efficiency of sound transmission.[8]Congenital syphilis is considered a risk indicator for hearing impairment (RIHI) by the *Joint Committee on Infant Hearing* (JCIH)[11], which makes neonates more susceptible to this problem.

Due to these and other indicators, as well as the possibility that children without risk indicators (RI) may have hearing impairment, Neonatal Hearing Screening (NHS) programs are necessary, which aim at early identification and intervention.[9]

NHS became mandatory in 2010 with Federal Law No. 12,303 and should be performed, preferably, in the first days of life (24 to 48 hours) in the maternity ward, and, at most, during the first month of life, except in cases when the child's health does not allow the exams to be performed.[10-22]

Based on these premises, this study aims to analyze the results of NHS in neonates whose mothers were diagnosed with syphilis during pregnancy.

METHOD

This cross-sectional and retrospective study resulted in the analysis of the results found in the Neonatal Hearing Screening of live newborns from a maternity hospital in a University Hospital whose mothers were diagnosed with syphilis during pregnancy. The present study was approved by the Research Ethics Committee of the institution under number 2020-0299 and CAAE: 32690820.5.00005327.

The study sample consisted of a sample of newborns of both sexes, with the presence of a risk indicator for hearing loss of maternal syphilis. The hearing screening was performed by the Speech Therapists who perform the exam at the hospital. The inclusion criteria for the study were:

- Newborn hearing screening at the hospital where the study was developed;
- Complete registration of information in the electronic medical record;
- Positive serology for syphilis in the current pregnancy.

The exclusion criteria for the study were:

- Data prior to January 2018 and after April 2020;
- Presence of other risk indicators for hearing impairment besides syphilis in pregnancy

The sample of the present study was divided into two groups of newborns, determined by syphilis and syphilis with intermediate hospitalization. The syphilis group consisted of mothers who had syphilis diagnosed during pregnancy, underwent the correct treatment recommended14 and who, at the time of admission, had their tests negative or a drop in the titers of the *Venereal Disease Research Laboratory* (VDRL) laboratory test, which identifies whether the patient has syphilis.

The group determined by syphilis requiring intermediate hospitalization consisted of mothers who had syphilis diagnosed during pregnancy, underwent incomplete treatment or did not undergo treatment at all, and whose newborns had their tests positive for syphilis and who required prophylaxis for the disease.

The neonatal hearing screening protocol at the hospital where the research was carried out includes the group with and absence of a risk indicator for hearing loss. In order to choose the appropriate protocol for performing the test (Transient Evoked Otoacoustic Emissions - TOAE and/or Automatic Brainstem Auditory Evoked Potential - BAEP-A), the presence of RIHI is first verified, according to the JCIH[11] criteria and adapted to the routine of the institution where the tests were performed.

To start the NHS process, a list of newborns eligible for the exam is checked in the system, that is, those who are already between 24-48 hours after birth. The request for the exam must be included in the hospital's electronic system. Next, a medical record search is carried out in order to search for clinical information and the presence of risk indicators in the maternal and/or newborn history. After validating this information, the speech therapist goes to the bedside of the puerperal woman to confirm the NB's data. Some questions are asked, referring to family history, prenatal progress, childbirth and puerperium.

The exams can be performed both in a specific room and in the bed itself, taking into account the environmental noise and the clinical conditions of the neonate. For NHS, in the study, the Transient Evoked Otoacoustic Emissions (TOAE) and the Automatic Brainstem Auditory Evoked Potential (AABR) were used.

TOAE is a fast, simple, non-invasive test with high sensitivity and specificity, capable of identifying most cochlear hearing loss. A probe, together with the olive, is positioned in the ear canal of the NB where the emissions were researched using the *Madsen® AccuScreen equipment of the* Otometrics *brand*, where the response is detected through the analysis of valid peaks in the frequency range of 1Hz – 4Hz. The test must register a total of at least 8 valid peaks in alternating directions (counted both above and below the midline) to result in pass, which indicates that the patient has normal functioning of the outer hair cells in the area corresponding to the test signal.[13]

If the result passes in both ears, the newborn is released, with the normal exam and recorded in his Child Health Handbook, in the hospital's database spreadsheet and released in the report of the institution's electronic system by the hired speech therapist. The result of failure in this test, soon after the TOAE is performed, the BAEP-a search is performed for such confirmation.

For this study, as the neonates had RIHI, it was recommended that testing be performed with the AABR. This indication is due to the fact that in neonates and infants with RIHI there is a higher prevalence of retrocochlear hearing loss, which is not identifiable through TOAE recording [12].

To perform the AABR, disposable electrodes are connected to the device's electrode cable; Cleaning the newborn's skin is performed with abrasive paste or chlorhexidine aqueous solution soaked in gauze or cotton. These electrodes are positioned on the upper part of the forehead, malar region and on the nape of the newborn's neck. For better stimulus conduction, a drop of conductive gel is used on the electrodes.

After placing electrodes, the probe with olive is positioned in the ear canal of the newborn. In order to avoid irritation on the newborn's skin, a medium-chain triglyceride solution is used, made available by the institution, soon after the removal of the electrodes.

The AABR is performed with the same equipment used for the investigation of otoacoustic emissions, with the result being indicated by **"✓"** and the result by **"X".**

The newborn who fails the hearing screening (TOAE and AABR) is referred for retesting at the Speech-Language Pathology and Audiology sector, at the outpatient level, located in the same institution. A retest date is provided in 15 days and/or according to the available schedule and parents are advised of the importance of performing a new exam to rule out (or not) a hearing loss. In case of non-attendance on the stipulated date, an active search is carried out by the speech-language pathology team, according to the telephone contact previously informed at the time of scheduling the retest, in order to clarify the non-attendance at the exam. If the non-attendance persists, a telegram is sent to the residence, informing of the legal terms in relation to the realization of the TAN and scheduling a new time for the retest. If the guardians still do not show up with the child for the retest, the exam is canceled in the system, and the non-attendance is recorded.

The newborn who undergoes the retest and who still persists in the failure is referred to the diagnostic stage. A complete audiological evaluation is performed, again including the AABR, clinical BAEP (neural and airway and bone auditory threshold). The neonate with a risk indicator who passes this evaluation is released and returns after three months for a new stage of electrophysiological examinations; the newborn who persists in failing is regulated by the Municipality's own Health Department. When hearing loss is diagnosed, the newborn is included in the auditory rehabilitation program, with the selection and adaptation of hearing aids, hearing speech therapy and, if necessary, referrals and evaluations for the use of cochlear implants (CI) are made.

All the data necessary for this research work were obtained after consulting the electronic medical records of the patients, and a database was developed.

For data analysis, quantitative variables were described as mean and standard deviation or median and interquartile range. Categorical variables were described as absolute and relative frequencies. After collecting the data, they were arranged in a spreadsheet in Microsoft Excel, based on the protocols used, and were later analyzed in the Statistical Package for Social Science (SPSS) software.

To compare medians between the groups, the Mann-Whitney test was applied. The association between categorical variables was analyzed using Pearson's chi-square test or Fisher's exact test. The level of significance was set at 5% ($p<0.05$) and the analyses were performed using the SPSS software, version 28.0.

RESULTS

During the period selected for the development of the study, 5,579 neonates were screened at the hospital. As the objective of the research was to evaluate only neonates whose mothers were diagnosed with syphilis during pregnancy, 203 medical records of newborns with the presence of this indicator were selected. Of these, 34 were excluded due to the presence of other risk indicators associated with syphilis.

Thus, 169 medical records of newborns were analyzed, which were divided into two groups: syphilis and syphilis requiring intermediate hospitalization (those who required low-risk intermediate hospitalization for Benzilpenicillin for the treatment and prophylaxis of the disease). The mean age at the first test was 2 days, with a predominance of males. There was no statistically significant association between the results of the tests (1st and retest) with the baby's gender ($p>0.50$). (Table 1)

Regarding neonatal hearing screening, BAEP-A prevailed as the first choice in the examination protocol to be performed on the newborn. In the comparative analysis between the right and left ears, there was no significant difference between the pass/fail results, and the pass result prevailed in both ears. (Table 2)

It was found that 37 neonates failed the NHS (Table 2), but only 29 neonates underwent the retest (Table 3). It is observed that the time between the 1st neonatal hearing screening test and the necessary retest was longer in the Syphilis group (17.5 days). The AABR was the most used in the retest in both groups.

Despite being close to the limit value ($p=0.068$), in the comparative results of pass and failure between the ears, no statistically significant difference was found in the retest result ($p>0.50$). Regarding the retest, three individuals in the sample remained with the altered test, but only one newborn in the syphilis group requiring hospitalization (Table 3) attended the diagnostic tests, which was diagnosed with conductive hearing loss, in a first clinical evaluation. In a second examination, carried out later, however, clinical BAEP was found to be within normal standards, both in terms of the absolute and relative latencies of waves I, III and V and the minimum level of response for the visualization of wave V (20dB in both ears).

Tabela 1 – Caracterização da amostra

Variáveis	n=169
Idade no 1º teste (dias) – mediana (P25 – P75)	2 (2 – 3)
Sexo – n(%)1[1]	
Feminino	81 (47,9)
Masculino	88 (52,1)
Indicador de risco –n(%)	
Sífilis sem internação	150 (88,8)
Sífilis com internação intermediária	19 (11,2)

Legenda: n= número; [1]Não houve associação estatisticamente significativa dos resultados dos testes (1º e reteste) com o sexo do bebê (p>0,50).

Tabela 2 – Triagem Auditiva Neonatal

Variáveis	Amostra total (n=169)	Sífilis (n=150)	Sífilis com internação intermediária (n=19)	p
Tipo de exame – n(%)				0,710
EOAT/PEATE-a	6 (3,6)	5 (3,3)	1 (5,3)	
PEATE -a	159 (94,1)	141 (94,0)	18 (94,7)	
EOAT	4 (2,4)	4 (2,7)	0 (0,0)	
Resultado Orelha Direita – n(%)				0,499
Passa	143 (84,6)	128 (85,3)	15 (78,9)	
Falha	26 (15,4)	22 (14,7)	4 (21,1)	
Resultado Orelha Esquerda – n(%)				1,000
Passa	150 (88,8)	133 (88,7)	17 (89,5)	
Falha	19 (11,2)	17 (11,3)	2 (10,5)	
Resultado Final (Ambas as orelhas)– n(%)				1,000
Passa	133 (78,7)	118 (78,7)	15 (78,9)	
Falha	36 (21,3)	32 (21,3)	4 (21,1)	
Precisou retestar – n(%)	37 (21,9)[1]	32 (21,3)	5 (26,3)	0,569

Legenda: n= número; EOAT= Emissões Otoacústicas Evocadas Transientes; PEATE-a= Potencial Evocado Auditivo de Tronco Encefálico Automático; [1]No resultado final, 01 neonato com resultado passa realizou reteste por indicação da Fonoaudióloga do serviço *Fisher Exact Test

Tabela 3 – Resultados do reteste

Variáveis	Amostra total (n=29)	Sífilis (n=24)	Sífilis com internação intermediária (n=5)	p
Tempo do 1º teste até o reteste (dias) – mediana (P25 – P75)	17 (9 – 24)	17,5 (10 – 23)	10 (6 – 44)	0,845
Tipo de exame – n(%)				0,071
EOAT/PEATE-a	1 (3,4)	0 (0,0)	1 (20,0)	
PEATE-a	26 (89,7)	22 (91,7)	4 (80,0)	
EOAT	2 (6,9)	2 (8,3)	0 (0,0)	
Resultado Orelha Direita – n(%)				0,172
Passa	28 (96,6)	24 (100)	4 (80,0)	
Falha	1 (3,4)	0 (0,0)	1 (20,0)	
Resultado Orelha Esquerda – n(%)				0,068
Passa	26 (89,7)	23 (95,8)	3 (60,0)	
Falha	3 (10,3)	1 (4,2)	2 (40,0)	
Resultado Final (Ambas as orelhas) – n(%)				0,068
Passa	26 (89,7)	23 (95,8)	3 (60,0)	
Falha	3 (10,3)	1 (4,2)	2 (40,0)	
Realizou exames complementares – n(%)	1 (3,4)	0 (0,0)	1 (20,0)	0,172

Legenda: n= número; EOAT= Emissões Otoacústicas Evocadas Transientes; PEATE-a= Potencial Evocado Auditivo de Tronco Encefálico *Fisher Exact Test

DISCUSSION

In this study, 169 medical records were analyzed, which were divided into two groups: syphilis and syphilis with intermediate hospitalization. This amount is compatible with the number of children investigated in another study.[19]Syphilis is an RIHI described by JCIH11. Some early detection programs select newborns with a higher probability of some hearing impairment, where the objective is to select only neonates with RIHI, directing them to specific protocols for NHS.[21]In the present study, we specifically analyzed the RIHI syphilis, and these findings are similar to previous studies where this indicator is one of the most prevalent.18-19-20-21

Regarding the sample evaluated, the mean age in days of NHS was 2 days, that is, within the minimum period of 24 to 48 hours of life and up to a maximum of 30 days as recommended by the Neonatal Hearing Screening Guidelines.[10-22]This data may reflect on the active search and the importance of early identification of a hearing impairment, where the professionals involved in this process, speech therapists, physicians, nurses, who work directly or indirectly in the NHS, are committed and attentive to signal probable risk indicators and their early intervention, in order to refer the hearing impairment as soon as possible when the hearing impairment is effectively diagnosed.

Of the newborns participating in the study, 52.1% were male and 47.9% female. In other studies, the authors show that the percentage of NHS was higher in males.[15-16]In the study by

RODRIGUES et al.(2016)[17], the percentage of NHS performed in males was 53.85% and females were 46.15%, contrary to the study by POZZI et al. (2021).[19]The findings of the present study reveal that there was no statistically significant association between the results of the tests (test and retest) and the baby's gender (p>0.50).

In the present study, it was evidenced that the AABR test was the test chosen in most cases as the first to be performed in NHS, due to the standard protocol used in the institution, which makes it possible to identify retrocochlear alterations. Although syphilis is treated appropriately during pregnancy, the protocols recommend that these neonates undergo more specific tests.[21]The findings of the present study show the prevalence of the results passed in both ears in both groups.

These findings are similar to those found in the scientific literature, since in studies carried out in neonates with the same RIHI the results are that both ears are passing, however, contrary to this study, the protocol used in NHS was TOAE in a group with RIHI but also in control groups for comparison purposes.[20]

It is important to emphasize that the result passed the test means that at the time it was carried out, the results were compatible with the expected responses in the AABR, that is, at the level of the brainstem and in the TOAE compatible with the integrity of the outer hair cells.[16]The literature shows that NHS, including TOAE and AABR tests, is essential both for early detection of hearing impairment and for subsequent referral for rehabilitation.[16]

The retest stage must take place within 30 days after the test.[11]The retest should be performed in both ears, even if the test failed unilaterally, a criterion that was evidenced in this study, where the time in days of the retest in relation to the first test performed was within the expected time: 17.5 days. The findings of the present study are in line with other studies regarding the flaw result, where 21.9% of neonates in the normal sample were evidenced in this study, a slight increase in relation to the 11.5% found by some researchers.19

Findings related to NHS and retesting are worrisome, considering the purpose of screening, to monitor the child's auditory development.[19]Even with an active search for newborns who failed the NHS retest for the time being, in this study it was noted that only 3.4% of the total sample continued treatment and had their referral for diagnosis.

The data from this study corroborate the quality indicators for screening established by the JICH, where a maximum of 4% of referrals for complete hearing evaluation after NHS is suggested.[18]If the newborn does not attend the retest, the child's hearing health is compromised.[20] From the audiological point of view, all newborns exposed to maternal syphilis, regardless of whether or not there has been adequate treatment, should undergo evaluation and monitoring every six months until the age of two, as well as perform treponemal tests after 18 months.[6-20]

In the sample analyzed, 37 patients were identified who failed the NHS and 29 underwent the retest; where only three persisted with the failure. After an active search via telephone contact and telegram, only one patient returned for further evaluations and was referred for diagnosis, in which conductive hearing loss was identified. The first BAEP-diagnosis performed on the newborn presented a result indicative of conductive alteration. In the second BAEP-diagnosis, the result was the presence of waves I, III and V, with normal absolute and interpeak latencies and with a minimum response of 20dB. These data differ from those reported in the specialized literature, which states that neonates whose mothers have been diagnosed with syphilis have a greater chance of presenting sensorineural hearing loss18-20

CONCLUSION

The results of this study indicate that there was no association between the maternal diagnosis of syphilis and the presence of hearing loss in the screened neonates.

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Neonatal hearing screening in newborns of mothers diagnosed with toxoplasmosis during the prenatal period

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Maiara Rodrigues da Silveira[1], Cassandra Caye Anschau[2], Debora Ruttke Von Saltiél[3], Denise Saúde Kochhan[4], Adriana Laybauer Silveira Unchalo[5] and Adriane Ribeiro Teixeira[6]

ABSTRACT

Objective: To analyze the results of Neonatal Hearing Screening (NHS) in newborns whose mothers were diagnosed with toxoplasmosis during the prenatal period. Methods: This is an observational, cross-sectional and retrospective study, carried out at a University Hospital in the south of the country. The sample included neonates who had toxoplasmosis as the only Risk Indicator for Hearing Impairment (RIHI). Transient Evoked Otoacoustic Emissions (TOAE) and Automatic Brainstem Auditory Evoked Potential (AABR) were used for audiological evaluation of the sample (test and retest). The study was approved by the Research Ethics Committee (REC) of the institution. Results: The sample consisted of 72 newborns, 30 (41.7%) females and 42 (58.3%) males. Of the 72 newborns screened, 18 (25%) were referred for retesting. Of these, only 13 (72.2%) attended the retest, and the final result was the presence of normal hearing thresholds. Conclusion: The results of the study indicate that, in the sample studied, most of the newborns evaluated passed the Neonatal Hearing Screening (NHS). Among those who failed and attended the retest stage, all presented a bilateral response in the TOAE and AABR examinations, and there was no need for referral for audiological diagnosis.

Keywords: Hearing, Newborns, Toxoplasmosis, Congenital Toxoplasmosis, Electrophysiology.

[1] Highest degree of education: Postgraduate in Behavior Analysis Applied to Autism (ABA), Postgraduate in Assessment and Intervention in Child Language and Postgraduate in Neurofunctional Speech Therapy
Academic institution: Federal University of Rio Grande do Sul (UFRGS)
ORCID:https://orcid.org/0009-0009-4155-0627
[2] Highest degree of education: Specialist in Speech Therapy in Childhood
Academic institution: Hospital de Clínicas de Porto Alegre (HCPA)
ORCID: https://orcid.org/0009-0006-0959-0192
[3] Highest Degree of Education: Master of Science in Child and Adolescent Health
Academic institution: Hospital de Clínicas de Porto Alegre (HCPA)
ORCID: https://orcid.org/0000-0002-4290-6033
[4] Highest degree: Specialist in AudiologyAcademic institution: Hospital de Clínicas de Porto Alegre (HCPA)
ORCID: https://orcid.org/0009-0004-7828-1137
[5] Highest degree: Doctor of Child and Adolescent Health
Academic institution: Hospital de Clínicas de Porto Alegre (HCPA)
ORCID: https://orcid.org/0000-0003-0713-9016
[6] Highest Education Degree: Doctor in Biomedical Gerontology
Academic institution: Federal University of Rio Grande do Sul and Hospital de Clínicas de Porto Alegre (HCPA)
ORCID: https://orcid.org/0000-0003-4242-1666

INTRODUCTION

Toxoplasmosis is characterized by being a protozoosis, with a cosmopolitan distribution, caused by the protozoan Toxoplasma gondii (*T. gondii)*, an obligate intracellular parasite, whose definitive host is members of the felid family, with the domestic cat being the main transmitting agent, due to its proximity to humans and the ease of transmission of the parasite to the environment[1]. Congenital toxoplasmosis, in turn, is an infectious disease caused by the transmission of *T. gondii,* of the untreated or inadequately treated infected pregnant woman for the fetus[1]. During pregnancy, contamination occurs transplacentally, considering the risk of maternal-fetal infection directly proportional to the gestational age at which the primary infection occurs[2]. Regarding clinical manifestations, about 70 to 90% of infected newborns have the subclinical form of the disease, that is, they are asymptomatic at birth, and may manifest the signs and/or symptoms of infection throughout growth[2,3]. However, if these children are not diagnosed and treated early, they may have serious sequelae, such as neurological and ophthalmological complications and deafness. Among the involvements, sensorineural hearing loss has been described in about 20% of cases of congenital toxoplasmosis, especially in children who have not been treated or treated for a short period of time[4,5,6]. Considering that the first years of a child's life are essential for the acquisition and proper development of speech and language, since in this period the maturation process of the auditory system occurs, as well as the neuronal plasticity of the auditory pathway, the anatomical and physiological integrity of the auditory system is essential both at the peripheral and central levels for this development to occur satisfactorily[7,8].

From this perspective, the importance of early identification of hearing alterations is emphasized, followed by immediate and appropriate intervention, which makes the diagnosis of childhood hearing impairment essential, as it favors the global development of affected children close to that of a child without hearing deficits and, consequently, contributes to a better therapeutic prognosis for these children[7,8]. Thus, the main objective of Neonatal Hearing Screening (NHS) is to identify, mainly, neonates and infants at high risk of hearing loss in the neonatal period[9,10,11].

It should also be added that studies related to hearing loss associated with congenital toxoplasmosis in the infant population, especially in the neonatal period, and current studies have not been found, since the sequelae most described in the literature are related to ophthalmological and neurological alterations, and the real hearing impairment in this population at birth is unknown[12].

Thus, this research aims to analyze the NHS results of newborns whose mothers were diagnosed with toxoplasmosis during the prenatal period, born in a University Hospital in the south of the country.

METHODS

This is an observational, cross-sectional and retrospective study, whose study factor consisted of the analysis of the NHS results of neonates who had toxoplasmosis as the only Risk Indicator for Hearing Impairment (RIHI) in a University Hospital in southern Brazil.

This research was approved by the Research Ethics Committee (REC) of the institution where the study was developed, under protocol number 4,131,570, meeting all the necessary prerequisites for research with human beings (Resolution No. 466/12).

The study sample was characterized as non-probabilistic and by convenience. The inclusion criteria established were: newborns born to mothers diagnosed with toxoplasmosis in the prenatal period, of both genders, having undergone NHS between 24 hours of life and one month of age, and post-conceptual age equal to or greater than 37 weeks.

Regarding the exclusion criteria, neonates who died and neonates with the presence of any other RIHI were excluded from the sample, according to the *Joint Committee on Infant Hearing* (JCIH)[8]. After the inclusion and exclusion criteria were met, the results regarding NHS were analyzed.

Regarding the procedures performed, the newborns were submitted to NHS through the combination of Transient Evoked Otoacoustic Emissions (TOAE) followed by Automatic Brainstem Auditory Evoked Potential (AABR) examination, due to the presence of RIHI. However, it was observed that (12.5%) of the neonates in the sample underwent only the AABR.

TOAE were performed with the newborns lying in the hospital crib and/or on the lap of the mother or guardian, preferably in a postprandial condition and in a quiet environment, using the portable AccuScreen Madsen ® equipment, with click-type stimulus, at frequencies ranging from 1 to 4 KHz, with intensity ranging from 45 to 60 dBHL. The stability of the probe during the examination remained above 80% and the artifact below 20%. For the analysis of TOAE results, this equipment considers response peaks, and the presence of eight valid peaks in alternating directions is necessary to consider that the newborn "passed" the test.

The AABR was performed with the same equipment used for TOAE recording. With the neonates in natural sleep and in a non-noisy environment, the skin was cleaned and the disposable surface electrodes were positioned on the vertex, an active electrode, on the zygomatic, a ground electrode, and on the C7 vertebra, a reference electrode. In this examination, a click-type stimulus with an intensity of 30 dBNA was used, and the impedance of the electrodes was kept below 4 KΩ (*Ohms*). In the end, when the ideal parameters are reached, the equipment registers a "pass" or "fail" result. The "pass" result is defined when the equipment detects a response to the sound stimulus presented, through the probe attached to the newborn's external ear.

If the newborn presented a "pass" response in the first stage (test), the parents were guided by the speech therapist about the issues of the typical development of hearing and language, and how to proceed in case of any complication in the course of this development, being released after the orientations. If the newborn presented a "failed" response, that is, no response in one or both ears in the first stage (test), he was referred for retesting in approximately 15 days. If the "failure" persisted at the time of the retest, it was referred for audiological diagnosis. It is noteworthy that the retest was performed using the same procedures used in the first stage, i.e., a combination of TOAE and AABR tests.

Subsequently, secondary data analysis was performed by consulting the electronic medical records of neonates who underwent NHS and subsequent stages of it, when necessary (retest, evaluation and audiological diagnosis).

After data collection, they were arranged in a spreadsheet in the *Microsoft Office Excell® program and, later, analyzed in the Statistical Package for the Social Science* (SPSS) software, version 27.0. Quantitative variables were described as mean and standard deviation, and categorical variables as absolute and relative frequencies. To compare means, the Student's t-test was used. In the comparison of proportions, Pearson's chi-square test was applied. The results were considered significant when ($p<0.05$), with a confidence interval of 5%.

RESULTS

During the study period, 6,465 newborns were screened. Of these, 86 (1.33%) had RIHI for toxoplasmosis. Among the 86 newborns selected, 14 were excluded from the study because they were not in line with the inclusion criteria. Therefore, the final sample consisted of 72 neonates with a probable diagnosis of congenital toxoplasmosis, since all newborns exposed to maternal toxoplasmosis, regardless of whether or not the mother had undergone adequate treatment during the prenatal period, were referred for follow-up at the pediatric outpatient clinic for congenital toxoplasmosis, which is located at the University Hospital itself. The sample consisted of 30 (41.7%) female newborns and 42 (58.3%) male newborns. The mean age was 2.42±1.17 days. The data from the characterization of the sample regarding gender, gestational age, treatment for toxoplasmosis during pregnancy and tests performed on the newborn are described in (Table 1).

The "pass" rate of the newborns evaluated in this study was 75%, the "failure" rate corresponded to 25% and the non-attendance rate for the second stage (retest) was 27.8%. Data regarding NHS, according to the procedure performed, location, mean age of the newborns and retest can be seen in (Table 2). When correlating the variables researched with the general results in the NHS, it is highlighted that the variable related to the mean age of the newborns presented a significant difference when compared to the others ($p=0.006$), that is, the higher the age (in days), the

lower the rate of "failure" in the NHS. The correlation between the variables studied and the general results in NHS are shown in (Table 3). When comparing the NHS result according to the type of test performed (TOAE and/or AABR), no significant differences were found between the procedures (p=0.063) (Figure 1).

The occurrence of NHS failures was more prevalent in the left ear (LE) than in the right ear (RE) in both examinations. However, no significant differences were observed in relation to the ears tested (Figure 2).

Table 1. Sample characterization

Variables	**Total sample (n=72)**
Gender – n(%)	
Female	30 (41,7)
Male	42 (58,3)
GI – n(%)	
37 to 38 weeks	33 (45,8)
39 to 40 weeks	38 (52,8)
41 to 42 weeks	1 (1,4)
Toxogestational treatment – n(%)	
Yes	33 (45,8)
No	28 (38,9)
Incomplete	11 (15,3)
Exames RN – n(%)	
Yes	63 (87,5)
No	8 (11,1)
Under investigation	1 (1,4)
Echocerebral result – n(%)	
Normal	63 (87,5)
Changed	0 (0,0)
Didn't perform	9 (12,5)
Ophthalmological Evaluation Result – n(%)	
Normal	63 (87,5)
Changed	0 (0,0)
Didn't perform	9 (12,5)

Pearson's chi-square test - comparison between absolute (n) and relative (%) frequencies.
Legend: n = number of subjects in the sample; %= percentage; GA = gestational age; NB= newborn

TABLE 2. Percentages and frequencies of the variables studied and the results of the Neonatal Hearing Screening, according to the type of test performed

Variables	Total sample (n=72)
Age (days) – average ± SD	2.42 ± 1.17
Location: TAN (Rooming-in) – n(%)	- 72 (100)
TAN Procedure – n(%)	
PEATE-A	9 (12,5)
EOA + PEATE-A	63 (87,5)
EOAT (n=63) – n(%)	
Spent	52 (82,5)
Unilateral failed	9 (14,3)
Failed bilaterally	2 (3,2)
PEATE-A (n=72) – n(%)	
Spent	54 (75,0)
Unilateral failed	12 (16,7)
Failed bilaterally	6 (8,3)
Final result TAN– n(%)	
Spent	54 (75,0)
Failed	18 (25,0)
Need for retest – n(%)	
Yes	18 (25,0)
No	54 (75,0)
Retest attendance (n=18) – n(%)	
Yes	13 (72,2)
No	5 (27,8)
Retest method (TOAE + AABR) – n(%)	13 (100)
EOAT (n=13) – n(%)	
Spent	13 (100)
PEATE-A – n(%)	
Spent	13 (100)
Need for diagnosis (n=13) – n(%)	
No	13 (100)

Student's t-test - means and standard deviation; Pearson's chi-square test - absolute (n) and relative (%) frequencies.
Legend: n = number of subjects in the sample; % = percentage; SD= standard deviation; AT = neonatal hearing screening; TOAE = otoacoustic emission by transient stimulus; BAEP-A = brainstem auditory evoked potential.

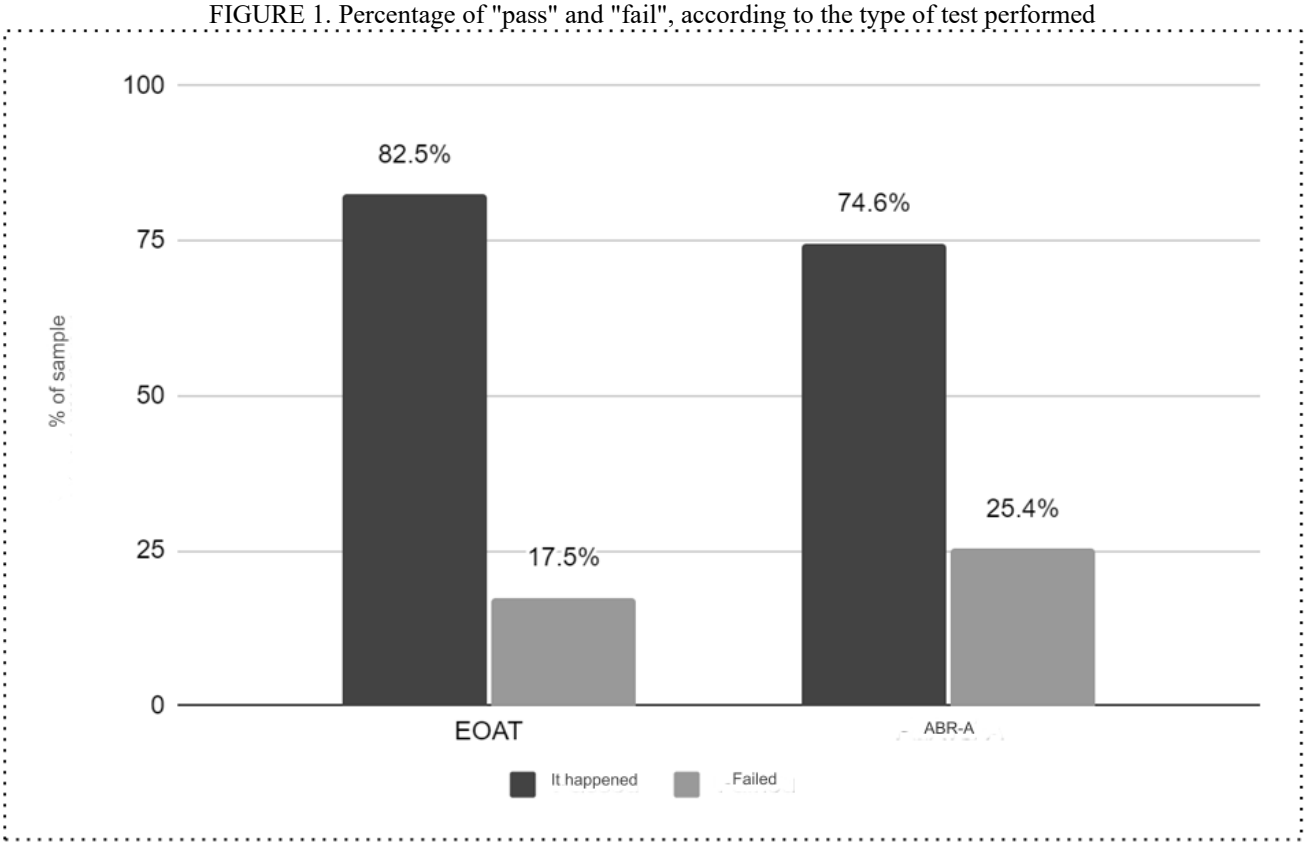
TABLE 3. Correlation between the variables studied and the general results of the Neonatal Hearing Screening

Variables	Spent	Failed	p
Gender – n(%)			0,098b
Female	19 (35,2)	11 (61,1)	
Male	35 (64,8)	7 (38,9)	
GI – n(%)			0,795b
37 to 38 weeks	24 (44,4)	9 (50,0)	
39 to 40 weeks	29 (53,7)	9 (50,0)	
41 to 42 weeks	1 (1,9)	0 (0,0)	
Treatment of gestational toxoplasmosis - n(%)			0,525b
Yes	23 (42,6)	10 (55,6)	
No	23 (42,6)	5 (27,8)	
Incomplete	8 (14,8)	3 (16,7)	
Exames RN – n(%)			0,055b
Yes	46 (85,2)	17 (94,4)	
No	8 (14,8)	0 (0,0)	
Under investigation	0 (0,0)	1 (5,6)	
Age at NHS (days) – mean ± SD	2.56 ± 1.31	2.00 ± 0.34	**0,006*[a]**

aStudent's t-test; bPearson's chi-square test - *significant values (p<0.05)

Legend: n = number of subjects in the sample; % = percentage; SD= standard deviation; GA: gestational age; NB: newborn; TAN= neonatal hearing screening.

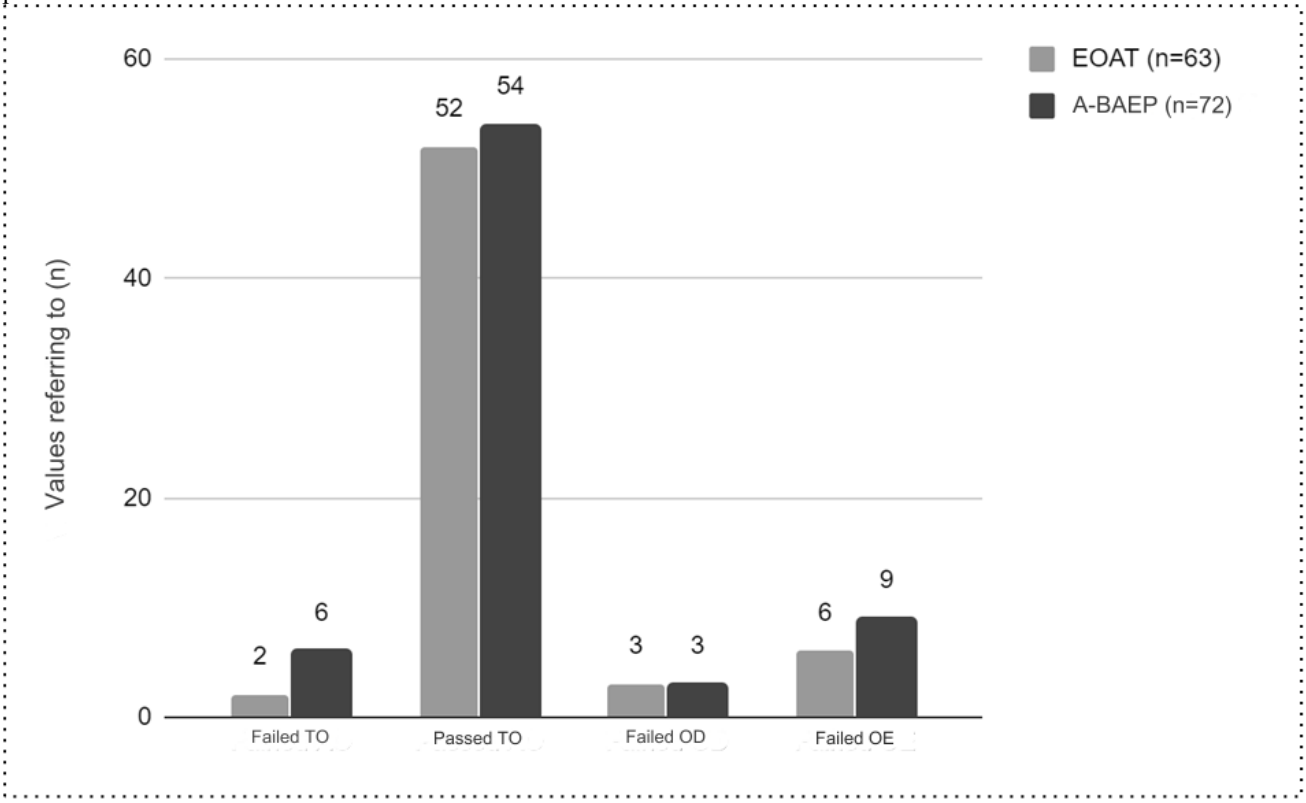
FIGURE 1. Percentage of "pass" and "fail", according to the type of test performed



Legend: %= percentage of the sample; TOAE = otoacoustic emission by transient stimulus; BAEP-A = brainstem auditory evoked potential.

- There was no statistically significant difference between the procedures (p=0.063).
- In this figure, only neonates who underwent both tests (n=63) were compared.

FIGURE 2. Comparison between the ears and the results of "pass" and "fail", according to the type of examination performed



Legend: n = number of subjects in the sample; TOAE = otoacoustic emission by transient stimulus; BAEP-A = brainstem auditory evoked potential; AO = both ears; OD= right ear; OE = left ear.

DISCUSSION

Congenital toxoplasmosis can result in hearing loss. However, in most cases, the disease manifests itself in the subclinical form in infected newborns, which directly impacts the early diagnosis of hearing impairment in these children[13]. In this sense, the performance of NHS becomes essential both for the detection of possible hearing alterations and for the subsequent referral of these for habilitation and rehabilitation in a timely manner, allowing the optimization of the intervention and effectively contributing to the child's development[8]. According to the recommendations of the JCIH[8], NHS should preferably be performed in the first days of life of the newborn and, at most, during the first month of life by means of electroacoustic measurements, with the use of TOAE and/or electrophysiological measurements through the AABR. For neonates and infants without RIHI, TOAE testing is used. For neonates and infants with RIHI, the AABR test is used, justifying the BAEP-A test as the first choice in order to rule out false-positive results, as well as the higher prevalence of retrocochlear hearing loss that cannot be identified by means of electroacoustic evaluation, such as the auditory neuropathy spectrum (ANSD)[9].

Regarding the time of NHS, all newborns in the present study were screened before hospital discharge, as recommended by the JCIH[8]. In addition, screening before hospital discharge and/or up to the first month of life is justified by the importance of diagnosis occurring as early as possible, in

an attempt to minimize any negative impact that hearing deprivation may have on the development of children's communicative, linguistic, affective, cognitive and social skills[14,15].

Regarding the general results in the NHS, the present study indicated that 54 (75%) of the newborns passed, while 18 (25%) failed. Regarding this finding, no studies were found in the scientific literature that analyze the percentage of "pass" and "fail" in the NHS with regard to this RIHI, to corroborate the results presented here. However, the literature describes that children diagnosed with congenital toxoplasmosis are at potential risk for hearing loss, and may have long-term hearing loss[8,16,17].

Of the total number of newborns, 18 failed the NHS, corresponding to 25% of those evaluated. Everyone The neonates who failed were referred for retesting within 15 days, and five (27.8%) did not attend, even after an active search. It is also noteworthy that, of the 13 (72.2%) newborns who attended the retest, all passed, indicating that at the time of the retest, the results were compatible with the presence of bilateral responses in the TOAE and AABR examinations. Thus, the retest is an essential part of the NHS, since at this stage there will be confirmation of the failure and referral for audiological diagnosis[8,10].

As for the newborns who were referred to the retest stage, it cannot be ruled out in this study that the reasons for the absence of answers in the first stage of the NHS could be associated with the age at which the neonates underwent the first assessment, since the newborns who presented a "pass" response had a mean age of 2.56±1.31 days and those who presented a "failure" response the mean age corresponded to 2.00± 0.34 days, indicating a significant difference (p=0.006) in relation to this variable. Thus, it was observed that the older the age (in days), the lower the "failure" rate of the newborns evaluated. In addition, factors such as the presence of caseous vernix in the ear canal, difficulty in sealing the external auditory canal (EAM), excessive environmental noise or noise from the newborn itself are also considered factors that contribute to the high rate of NHS retests[18].

Or JCIH[8] and the Multiprofessional Committee on Hearing Health (COMUSA)[19] emphasize the importance of adherence to the NHS, including in the retest stage, since dropout rates should remain low. On the other hand, in this study it was observed that 27.8% of the children scheduled did not show up for the retest, indicating a high rate of non-attendance. This characteristic corroborates other studies[20,21], considering that the dropout rates found in the literature were similar in relation to the percentage of children who did not continue the subsequent stages of NHS. Another finding of the present study refers to the predominance of male newborns 42 (58.3%). This finding corroborates a study carried out with children diagnosed with congenital toxoplasmosis, whose result was that 59.3% of the children evaluated were also male[12].

Regarding the ears tested, it was evidenced in the study that the occurrence of NHS failures was more prevalent in LE than in RE in both exams. This finding is in agreement with another study[22], which also found a higher occurrence of EO failures.

It was observed that there was no significant difference in terms of gender and mean gestational age between children who passed and failed NHS. In addition, no significant correlations were observed between the other variables analyzed, including treatment for gestational toxoplasmosis and newborn tests, with the results obtained in the tests.

It is also noteworthy that according to different studies[3,23,24] In the specialized scientific literature, children diagnosed with congenital toxoplasmosis had some type of hearing impairment, such as sensorineural hearing loss, as well as alterations in central auditory processing. However, in the present study, none of the newborns retested were referred for audiological diagnosis, i.e., none of the neonates had a confirmed diagnosis of hearing loss.

Therefore, the findings of the present study presented unprecedented results in relation to the audiological findings of these newborns, since no associations were observed between exposure to maternal toxoplasmosis (treated or inadequately treated) and the presence and/or absence of NHS responses. It is important to highlight that the audiological data of the sample studied refer to the period immediately after birth. However, it is not ruled out that auditory alterations may occur throughout the development of these children and, therefore, it is recommended that follow-up and auditory monitoring be carried out in order to identify, or not, long-term audiological alterations in these individuals. As a limitation of this study, it is possible to point out the scarcity of studies in the scientific literature with the same problem. In addition, due to the retrospective and cross-sectional nature of the research, the sample size ended up directly impacting the results obtained. These limitations should be considered and minimized in other studies, but they do not reduce the importance of this study, considering that it brought important information about a RIHI in which there is not much data in the literature, especially with regard to the neonatal period.

CONCLUSION

The results of the study indicate that, in the sample surveyed, most of the newborns evaluated passed the Neonatal Hearing Screening (NHS). Among those who failed and attended the retest stage, all presented a bilateral response in the TOAE and AABR examinations, and there was no need for referral for audiological diagnosis.

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Hospital hospitality and the health of the elderly: Contributions to humanized training in gerontological nursing

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Lizandra Quintiliano de Carvalho[1], Aline Miranda da Fonseca Marins[2], Francimar Tinoco de Oliveira[3], Rose Mary Costa Rosa Andrade Silva[4] and Eliane Ramos Pereira[5]

ABSTRACT

Introduction: It is urgent to align the professional training process with the health demands of the elderly, especially those related to humanization, hospitality, and hospital hospitality. Objective: To carry out an integrative health review on the humanization of care for the elderly, with emphasis on the humanization of hospital care and hospitality. Methodology: Integrative review carried out in the following databases: Virtual Health Library (VHL), *Medical Literature, Analysis and Retrieval System Online* (PubMed), Portal of the Coordination for the Improvement of Higher Education Personnel (CAPES) and Google Scholar. Health Sciences Descriptors (DeCS) and keywords were used. An advanced search was carried out for each of the following thematic axes: Axis 1: a) The humanization of care in the care of the hospitalized elderly, from the perspective of the nursing student: "Humanization of Hospital Care", "Humanization of Care", "Elderly", "Nursing", Axis 2: b) The contribution of the National Humanization Policy to hospitality in the care of the hospitalized elderly: "National Humanization Policy", "Hospitality", "Elderly", Axis 3: c) Hospital Hospitality and its possible contributions to humanized care for the elderly: "Humanization of Care", "Hospitality", "Hospital Hospitality" and "Elderly". Results: 10 articles were selected, whose texts were complete and freely available in Portuguese, English and Spanish, published in the last 10 years (2012-2022), which presented one or more descriptors/keywords selected in each axis described. Discussion: The findings pointed to: positive aspects that enable qualified and humanized care for hospitalized elderly people, from the perspective of nursing, such as: communication, welcoming, individualized care planning, needs/specificities of the user and respect for the identity of the elderly person); the need to dialogue about the aspects that permeate the humanization of care, the context of the creation of the National Humanization Policy, as well as the National Health Policy for the Elderly, reinforcing the guarantee of rights to this public and that include nursing as a promoter of the humanization of care; hospital hospitality can contribute significantly to the humanization of gerontological care using relational technology, welcoming, empathetic treatment and holistic strategic actions of care and awareness of the health team. Conclusion: The data discussed corroborate the triggering discussions about the improvement and qualification of care regarding the positive impact of hospital hospitality on the management of hospitalized care for the elderly.

Keywords: Humanization of Care, Hospital Hospitality, Aged, Gerontological Nursing.

[1] Nurse of the Multiprofessional Residency Program in Infectious and Parasitic Diseases, National Institute of Infectious Diseases Evandro Chagas, INI / Osvaldo Cruz Foundation (Fiocruz). Rio de Janeiro-RJ, Brazil.
E-mail: lizandraquintiliano@gmail.com
[2] Doctor Professor in Nursing, Anna Nery School of Nursing, Federal University of Rio de Janeiro (UFRJ). Rio de Janeiro-RJ, Brazil .
E-mail: alinemiranda@gmail.com
[3] Doctor Professor in Nursing, Anna Nery School of Nursing, Federal University of Rio de Janeiro (UFRJ). Rio de Janeiro-RJ, Brazil.
E-mail: frantoliveira@gmail.com
[4] Full Professor at the Fluminense Federal University. Aurora de Afonso Costa School of Nursing. Niterói – RJ, Brazil. Post-doctorate in Philosophy - IFCH/UERJ. PhD in Nursing-EEAN/UFRJ. PhD in Social Psychology - IFCH/UERJ.
E-mail: roserosa@id.uff.br
[5] Full Professor at the Fluminense Federal University. Aurora de Afonso Costa School of Nursing. Niterói – RJ, Brazil. Post-Doctorate (UERJ). PhD in Nursing (UFRJ). Specialist in Psychoanalysis and Mental Health (UERJ). Specialist in Logotherapy (SAPS, Colombia)
E-mail: elianeramos.uff@gmail.com

INTRODUCTION

The World Health Organization (WHO) instituted, based on the socioeconomic power of the country, the age classification of an elderly person. In developing countries, an individual who is 60 years of age or older is considered elderly. In developed countries, the age is increased to 65 years (WHO, 2002).

Currently, 125 million people are 80 years of age or older across the planet (PAHO, 2018). The reality in Brazil is no different from the world, with a mostly young population in the recent past, it is observed that currently, there is a significant number of elderly people (MIRANDA, et al, 2016).

Barreto et al. (2011) demonstrated that the drop in the fertility rate, the reduction in mortality and the various transformations that occurred in Brazilian society provided a demographic transition that has brought new challenges to the health system, which involve political mobilization.

By rationalizing the importance of quality of life, as well as associating this determinant with longevity, the plan was created: Decade of Healthy Aging 2020-2030. This action plan consists of a global strategy on ageing and health of the WHO and it is estimated that in these 10 years, combined, catalytic and sustained collaborations will be triggered. And the focus of the plan is the elderly (WHO, 2020).

In addition to socio-political actions, it is important to delve deeper into the possibilities inherent to the aging process. The longer the elderly person, the greater the number of hospitalizations, since, over the years, there is a greater physiological and functional decline that leads to more pathologies and health problems (Oliveira, et al, 2019).

Most health conditions in the elderly are related to chronic health disorders, especially non-communicable diseases (WHO, 2016).

Some factors contribute to the increase in hospital morbidity and mortality in the elderly population, including the higher incidence of functional deterioration, which were grouped mainly into three factors: less resistance to response to acute disease situations (greater underlying frailty), greater severity of the diseases that precipitated hospitalization and, finally, the possible inadequacy of the care provided (BAZTÁN, 2008).

With the purpose of consolidating the principles of the SUS in the different health scenarios as a transversal policy, the National Humanization Policy, launched in 2003, emphasizes the inclusion of differences in the management and care processes. Such changes are built not by an isolated person or group, but in a collective and shared way (BRASIL, 2013).

Humanization in conjunction with hospital hospitality has important potential for modulating quality care for the assisted client. For Boeger (2003, p.24), hospital hospitality is "the gathering of

all support services, which, associated with specific services, offer internal and external customers comfort, safety and well-being during their hospitalization period."

Certainly, an approach that involves hospital hospitality based on the humanization of care is essential to the care of the elderly (Marins and Slob, 2019). Since there is a concern with the process of student education in favor of expanded concepts about the health of the elderly, as pointed out in Article 10 of Law No. 8,842 (1994), which ensures the National Policy for the Elderly:

> "III – in the area of education: a) to adapt curricula, methodologies and didactic material to educational programs aimed at the elderly; b) to insert in the minimum curricula, at the various levels of formal education, contents focused on the aging process, in order to eliminate prejudices and produce knowledge on the subject; c) to include Gerontology and Geriatrics as curricular subjects in higher education courses [...]"

Thus, active methodologies can favor new ways of developing the learning process, aiming at the conditions to solve challenges arising from the essential activities of social practice, in different contexts (BERBEL, 2011).

Considering the change in the demographic profile, the aging of the population and also the difficulty of finding scientific studies in the area of health, on the theme of humanization and hospital hospitality in health care for the elderly, the following objectives were elaborated:

GENERAL OBJECTIVE

Carry out an integrative review on humanization in the care of the elderly, with emphasis on hospital hospitality.

SPECIFIC OBJECTIVES

To know the scientific production in health and nursing on the following thematic axes

a) The humanization of care in the care of the hospitalized elderly, from the perspective of the nursing student, b) The contribution of the National Humanization Policy to hospitality in the care of the hospitalized elderly, c) Hospital Hospitality and its possible contributions to humanized care for this elderly.

JUSTIFICATION

The emerging need of practice to direct care to a growing population profile and with different specificities in its care, leads us, primarily, to think about actions that can be resolute. In the area of nursing, situational diagnosis is a fundamental tool in the context of management.

Furthermore, with regard to scientific production, the National Agenda of Health Research Priorities (ANPPS) privileges "respecting national and regional health needs and increasing selective induction for the production of knowledge and material and procedural goods in priority areas for the

development of social policies" (Brasil, 2008, p. 13). The ANPPS was constituted as the movement to align health research priorities in Brazil and is composed of 24 sub-agendas (Ministry of Health, 2008). Being an impactful social response in health, subagenda number 6 has the theme: health of the elderly.

In this context, the Decade of Healthy Aging and the National Policy for the Elderly can also be mentioned, as a global and national strategy, respectively, which aim at the interests of guaranteeing the right to citizenship, health promotion, prevention and recovery, as well as greater visibility and prominence in political actions.

It is necessary to deepen the humanization and hospital hospitality in the health education process. Thus, this study can contribute to broaden discussions in the health area and, especially, in the nursing area, reducing the existing gaps in knowledge in gerontological nursing during the process of professional training of nurses, associated with humanization, hospitality and hospitality, with a view to the production and promotion of health in the hospital environment.

CONCEPTUAL FRAMEWORK

Humanization, a polysemic word, which refers in its concept within care to a human relationship (Simões et al., 2007). A different look at the assisted user, who, by the way, is another human being; The look based on humanization sees the integrality, identity and subjectivity of the other, with the necessary welcome for the construction of a satisfactory therapeutic process. Developed with quality, empathy, based on structural, political and ethical issues (COSTA, FIGUEIREDO AND SCHAURICH, 2009).

The contents that guide humanization in health began through the guidelines of the Ministry of Health (MS), which in 2000 launched the National Program for the Humanization of Hospital Care (PNHAH), aiming to bring improvements in care and attention to hospitalized users. However, in 2003, the National Humanization Policy (NHP) was established, which since then, has its principles (transversality, inseparability between care and management, protagonism, co-responsibility and autonomy of subjects and collectives), as well as its guidelines (welcoming, participatory management and co-management, ambience, expanded and shared clinic, valorization of the worker, defense of users' rights) practiced within the Unified Health System (SUS). (MORAES, 2017)

Humanization is configured as an ethical, aesthetic and political bet. Ethics, because it implies that users, managers and workers are committed to improving care, aesthetic because it allows a creative and sensitive process of health production by autonomous subjects and protagonists of a collective process. Politics refers to the social and institutional organization, where it is expected

that there is solidarity of the established bonds, the rights of users and the collective participation of the management process. (BRAZIL, 2006)

Florence Nightingale, in her Environmentalist Theory, believed that providing an adequate environment was something differential in the recovery of the sick. In the context of nursing, this concern with the environment has existed since the foundation of professional nursing in the second half of the nineteenth century, which reflects, nowadays, in humanized care, based on the control of the environment in which the patient is inserted, who is seen as a being of relationships and interactions with the environment (MORESCHI, 2011).

It is worth noting that, in his theory, the environment is only one of the means to develop humanized care, in addition to such devices: reception, risk classification; collegiate managers; training program in health and work; reference and matrix support teams; co-managed projects of environment, right to companion and open visit, and construction of collective processes for monitoring and evaluation of humanization activities (Freitas, 2013).

Making the environment conducive to health recovery comes up against commercial hospitality, which is a challenge for managers and service providers, including hospitals. Currently, it is perceived that some hospitals seek to transform their social environments into pleasant spaces for coexistence, an aspect that has been developed with hospital organizations, the concept of hospital hospitality, which aims to provide internal and external customers with situations of comfort, well-being and safety (BOEGER, 2003).

This concept has existed in Brazil for less than two decades and is not yet common sense in the health scenario (Santos and Junior, 2009). For a better understanding, it should be noted that in the hotel industry, the support services are those that are non-assistential, which operationally maintain direct contact with the client, companions, visitors and family members, such as: property security, hospitalization and reception, governance, nutrition and gastronomy.

For Boeger et al. (2011), the implementation of a Hospital Hospitality System (SHH) confers benefits, for example, of indirectly offering more time for the nursing team to care practices, with non-assistance being the responsibility of the multiprofessional hotel team. A study by the Brazilian Society of Hospital Hospitality, (2006) in a hospital that has been developed for more than 2 years, reveals significant improvements, covered in 30% more of the nursing time invested in care care.

In this sense, an approach that integrates humanization from the perspective of hospital hospitality is paramount when it comes to health care for the elderly in the hospital context (Marins and Slob, 2019). Nursing, when caring for a client, is also concerned with the environment that surrounds him. The hotel industry contributes precisely to this process, creating favorable and facilitating environmental conditions (DIAS, 2006).

That said, when thinking about humanization in nursing care, it is brought to light that it encompasses ethical interpersonal relationships in a dynamic that involves the potential of the human being, by addressing the issue of creativity and sensitivity and a commitment to respect the uniqueness of the other, as well as their citizenship. In this sense, the concept of humanization is articulated with that of care, contributing to the science of nursing (ARAÚJO and FERREIRA, 2011).

In this regard, it is worth noting that "the university is one of the levels of education that is responsible for the process of humanization, which enables the insertion of human beings in human society" (CASATE and CORRÊA, 2012, p.221).

Thus, there is a concern to align the nursing student education process with the context of the health of the elderly person and the humanization of care for this clientele, especially in the hospital context. To take care of the elderly, there is a need for humanization and awareness on the part of those who care. The student with this perception is probably prepared to deal with the elderly, as it does not exclude the subjectivity involved in the interpersonal relationships of care (MEDEIROS, ARAÚJO AND BARBOSA, 2008).

It is essential that undergraduate health courses, with emphasis on Nursing, include content related to Gerontology and Geriatrics, following the perspective of the increase in the elderly population, higher life expectancy, demand on health services and in accordance with policies aimed at this population (RODRIGUES, 2018).

The academic experience enables a first contact with the elderly patient and allows them to acquire and improve specific nursing skills and abilities in the field of Elderly Health (Melo et al, 2014). To this end, the use of methodologies that stimulate the student's protagonism are fundamental for the teaching of Nursing allied to Human Aging, especially with regard to the construction of teaching-learning-health processes. Essentially when directed to the integrality of care for the elderly, especially in the SUS scenario. (PRADO, et al, 2012)

METHODOLOGY

Integrative literature review carried out in the following databases: Virtual Health Library (VHL), *Medical Literature, Analysis and Retrieval System Online* (PubMed), Portal of the Coordination for the Improvement of Higher Education Personnel (CAPES) and Google Scholar, based on six proposed steps: identification of the theme and selection of the hypothesis or research question for the elaboration of the integrative review; establishment of criteria for inclusion and exclusion of Studies; definition of the information to be extracted from the selected studies; evaluation and interpretation of the studies included in the review and, finally, the review/synthesis of knowledge is presented (MENDES, SILVEIRA AND GALVÃO, 2008).

Thus, Health Sciences Descriptors (DeCS) and keywords were used, justified by the lack of DeCS and *Medical Subject Headings* (MeSH) on hospital hospitality. These were accompanied by the Boolean operator "AND" and "OR", in addition to the quotation marks, in an advanced search, for the following thematic axis: **Axis 1:** a) The humanization of care in the care of the hospitalized elderly, from the perspective of the nursing student: "Humanization of Hospital Care", "Humanization of Care", "Elderly", "Nursing", **Axis 2:** b) The contribution of the National Humanization Policy to hospitality in the care of the hospitalized elderly: "National Humanization Policy", "Hospitality", "Elderly", **Axis 3:** c) Hospital Hospitality and its possible contributions to humanized care for the elderly: "Humanization of Care", "Hospitality", "Hospital Hospitality" and "Elderly".

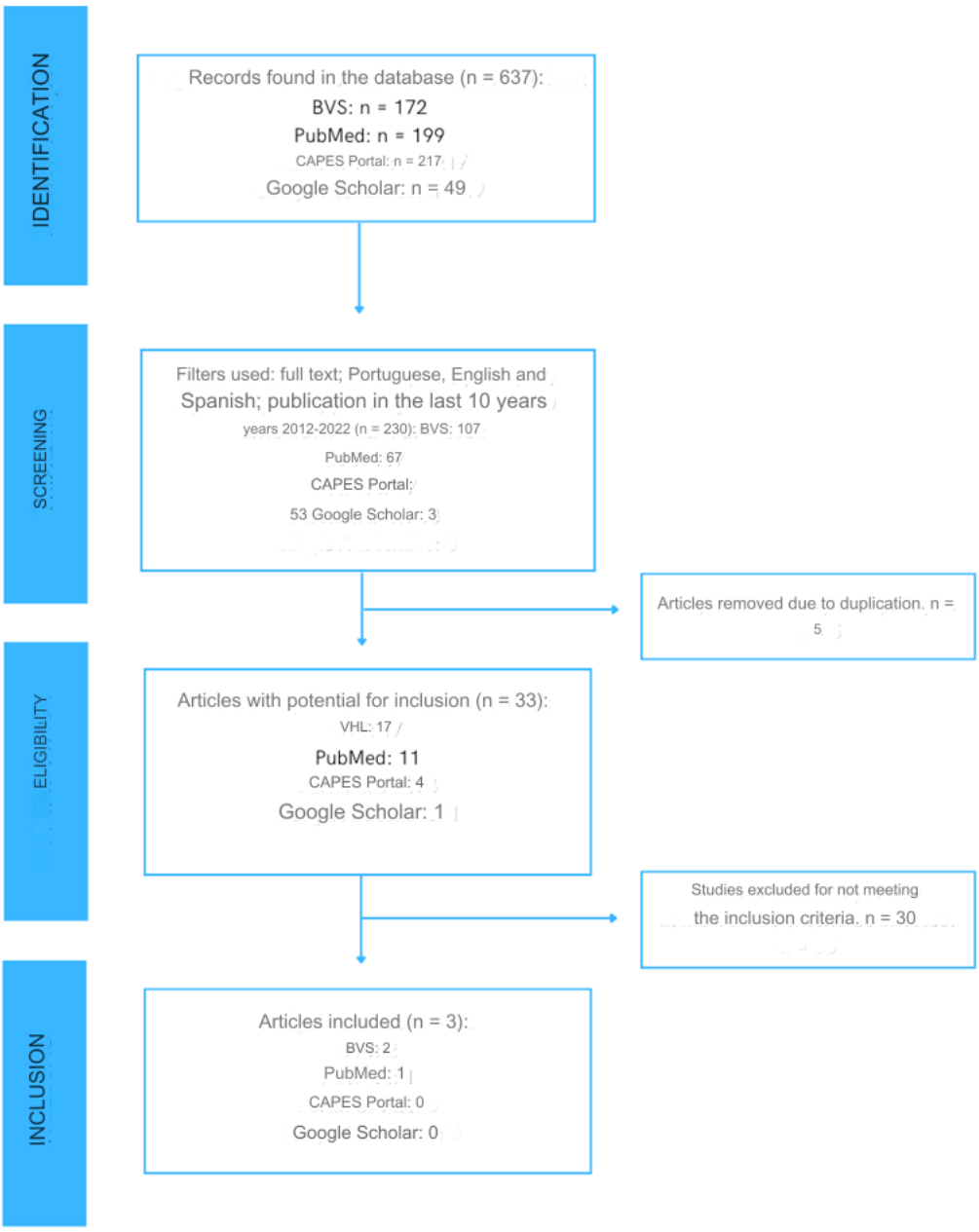
In all the platforms used, the inclusion criteria were: having full text available for free; text in Portuguese, English or Spanish; having been published in the last 10 years (2012-2022); sharing one or more selected descriptors/keywords; association with the central theme "Hospital Hospitality and the Humanization of Health Care for the Elderly".

Studies that did not address the central theme of this review, incomplete/unavailable texts, such as theses, dissertations, monographs, experience reports, and duplicate publications were excluded. The articles were selected based on the evaluation of the abstracts, followed by a critical and eligibility analysis based on the reading of the publications in full.

RESULTS

THE HUMANIZATION OF CARE IN THE CARE OF THE HOSPITALIZED ELDERLY, FROM THE PERSPECTIVE OF NURSING

Figure 1: Flowchart for the selection of publications of thematic axis 1.



Source: The author, 2022.

The selected studies were distributed according to title, author and year, objective(s) and main results, as shown in Table 1 below:

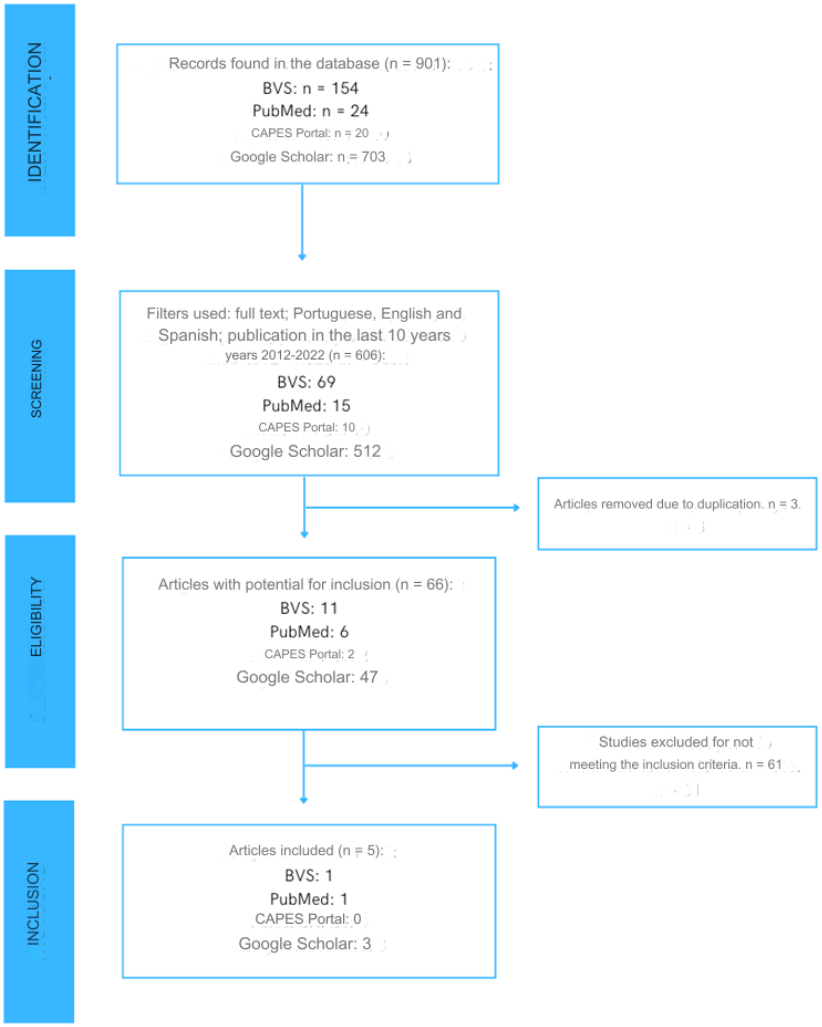
Chart 1: Distribution of the studies selected using the descriptors: "Humanization of Hospital Care", "Humanization of Care", "Aged" and "Nursing".

Code	Title	Author(s)/Year	Main results
A1	Strategies to humanize the care of the hospitalized elderly: a study with clinical nurses	Dias KCCO, et al. (2015).	Approach to three main strategies for the humanization of care for the elderly: welcoming, individualized nursing care and respect for the autonomy of the elderly patient; respect for the beliefs, values, privacy and identity of the elderly patient; valuing verbal and non-verbal communication for the patient and his family.
A2	Nursing work in the care of hospitalized elderly: limits and particularities	Sanguino GZ, et al. (2018).	It was identified that nursing care for hospitalized elderly faces limits and difficulties from different sources. In addition, nursing care for hospitalized elderly people requires peculiar attention imposed by the characteristics of aging; and that nursing care for hospitalized elderly people is facilitated by collaborative practice among those involved.
A3	*The effects of empathy skills training on nursing students' empathy and attitudes toward elderly people*	Gholamzadeh S, et al. (2018)	The results showed that the empathy skills training program had a significant impact on students' average empathy scores and attitudes toward older adults.

Source: The author, 2022.

THE CONTRIBUTION OF THE NATIONAL HUMANIZATION POLICY TO HOSPITALITY IN THE CARE OF THE HOSPITALIZED ELDERLY

Figure 2: Flowchart for the selection of publications in thematic axis 2.



Source: The author, 2022.

The selected studies were distributed according to title, author and year, objective(s) and main results, as shown in chart 2 below:

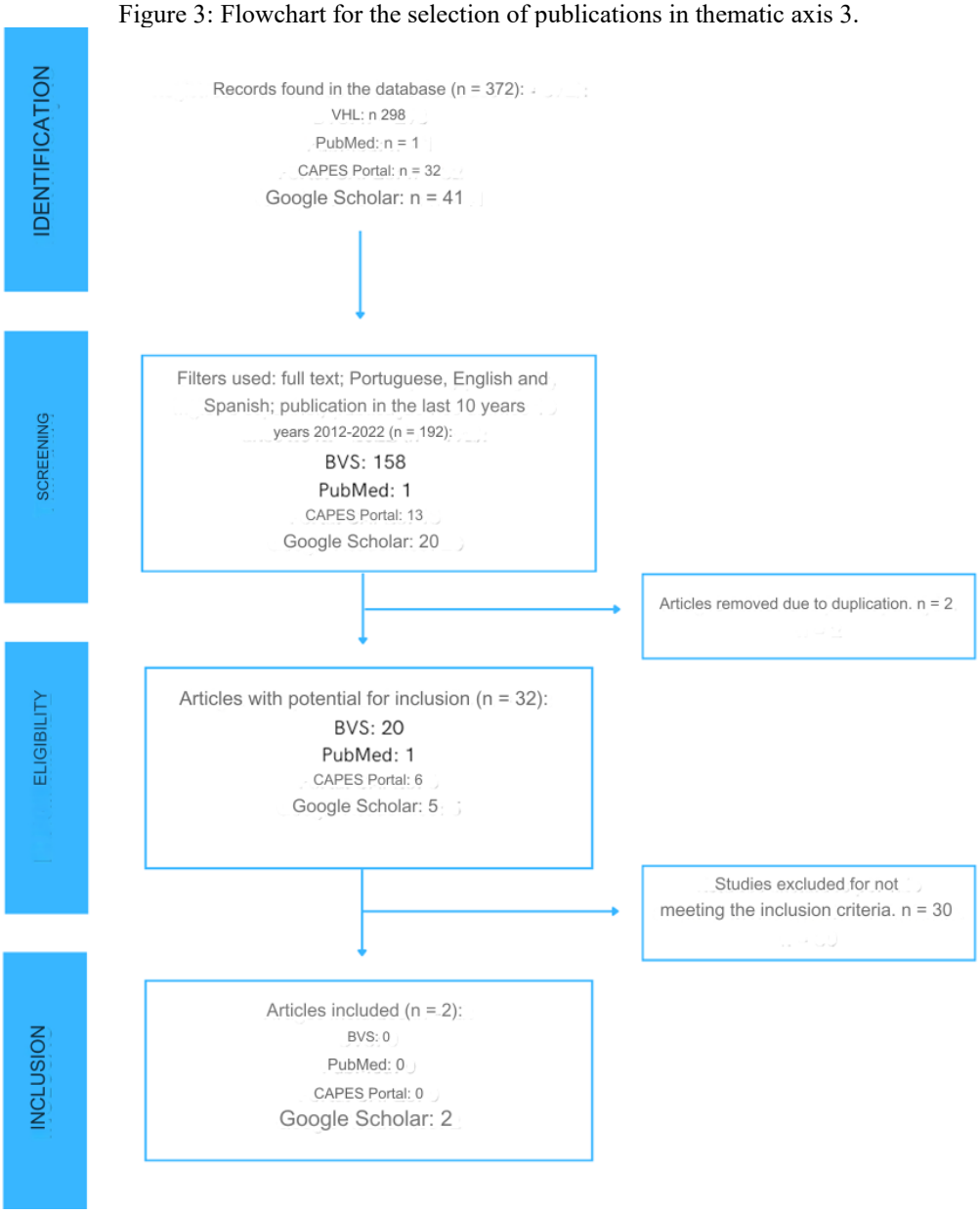
Chart 2: Distribution of the selected study using the keywords: "National Humanization Policy", "Hospital Care" and "Elderly".

Code	Title	Author(s)/Year	Main results
A4	Welcoming the elderly in health services: an integrative review	Silva, TN, et al. (2018)	Welcoming is seen as an important part of humanized care. In addition, it highlights the hospitality of health services to users and their families.
A5	Humanization Practices in Elderly Care	Oliveira, CR. et al. (2021)	It describes the importance of nursing care for the elderly, based on playful practices and the principles of humanization.
A6	Humanization in Health with Emphasis on Elderly Care Provided by Nursing Professionals	Silva, S.; Cardoso, A.; Linhares, OS. (2020)	It shows the importance of humanized care for elderly patients and the role of nursing professionals in this care. The nurse is the professional in front of the first care, so that such care is fundamental and makes a difference.
A7	Humanization of nursing care in elderly patients	Vieira, PF. and Almeida, MAR. (2020)	It denotes that one of the roles of nursing in the face of humanized care for the elderly should be the execution of attitudes that aim to support and treat this client in a particular way, valuing him, not only focusing on the disease, but covering it in an integral, holistic and humane way.
A8	Hospitalized Elderly: focus on the humanization of nursing care	Silva, FSA. et al. (2022)	Humanization in the care of hospitalized elderly is a theme that is still little discussed in the academic and sociopolitical spheres, privileged spaces for the construction of intervention proposals can, in the medium and long term, attenuate the incidences of this social problem.

Source: The author, 2022.

HOSPITAL HOSPITALITY AND ITS POSSIBLE CONTRIBUTIONS TO HUMANIZED CARE FOR THE ELDERLY

Figure 3: Flowchart for the selection of publications in thematic axis 3.



Source: The author, 2022.

The selected studies were distributed according to title, author and year, objective(s) and main results, as shown in Table 3 below:

Chart 3: Distribution of the selected study using the descriptors: "Humanization of Care", "Hospitality", "Hospital Hospitality" and "Elderly".

Code	Title	Author(s)/Year	Main results
A9	The Elderly and the Humanization of the Hospital Environment: Contributions to Nursing	Marins, AMF. e Slob, EMGB. (2019).	The main elements that move the gear of humanized care for the hospitalized elderly are: relational technology, welcoming, and empathy.
A10	Hospital Hospitality for the Elderly	Silva, D.G. et al. (2019)	Humanization strategies aimed at hospital hospitality in the care of elderly patients, contributing to the stay and recovery.

Source: The author, 2022.

DISCUSSION

Corresponding to the literature search, the studies found categorized into three distinct axes remain on the agenda for discussion, **Axis 1** - articles: **A1, A2 and A3**; **Axis 2** - articles: **A4, A5, A6, A7 and A8** and **Axis 3 -** articles **A9 and A10**, to be presented below. It is worth mentioning that this construction allows us to understand emphatically the gaps in health care in relation to the care of the hospitalized elderly in a solidified way, in order to provide a product directed between humanization and hospital hospitality for this public.

AXIS 1: THE HUMANIZATION OF CARE IN THE CARE OF THE HOSPITALIZED ELDERLY, FROM THE PERSPECTIVE OF NURSING

The findings of this axis pointed out aspects that enable qualified and humanized care for hospitalized elderly people, from the nursing perspective, among which communication , welcoming, individualized care planning to the needs/specificities of the user, respect for the identity of the elderly person stand out. As well, investment in didactic content on the theme within the nursing education process and for those who already work in the professional scenario, permanent education as a fundamental point.

According to Morais et al. (2009), in order to provide humanized care in the hospital context, it is necessary to have technical competence, sensitization to understand the client in his personal and subjective experience, to satisfy his essential needs - based on his speech and, above all, to preserve his autonomy. This care format becomes a concern for health professionals, especially in relation to elderly clients, due to the unique conditions they present. Thus, rescuing humanity in health care for hospitalized elderly people is the first step towards approaching the qualified care that is intended to be offered.

In A1, the authors point to welcoming and attention as the main strategy for humanizing the care of the hospitalized elderly: "The nurses highlighted the relevance of welcoming through the

promotion of comfort, support and attention, respecting the specificities (biological, psychological and psychosocial changes) and autonomy of the hospitalized elderly." (DIAS et al, 2015, p.1835).

Furthermore, in A1, the ethics within this process are addressed throughout the work, which makes it essential that the nursing professional: "superimpose good communication with the patient, to the detriment of their own individual values and beliefs" (Dias et al, 2015, p.1835). So that from this, barriers are provided with opportunities, and thus, a high level in the process of communication and understanding of the other.

For Morais et al (2009, p.324), "the dialogical interaction between the caregiver and the person being cared for presents itself as a possibility for the construction of humanized care practices". Therefore, communication becomes inseparable from the humanization of nursing care, only from this is it possible to know the emerging demands of the user and the discomforts caused by the illness process, as well as hospitalization. It is worth mentioning that this moment highlights the vulnerabilities of these individuals, which generate worries, anxiety, high stress, which makes the bond paths of approximation and warmth.

The findings in A1 and A2 denote the importance of respecting the identity of the elderly person, who is not lost when entering a health institution and when seen in an assertive, autonomous way, the dialogue is carried out eye to eye. By analogy, in addition to their identity, their desires, beliefs, sexuality, affections also need to be made visible. Rocha et al (2011), bring to light that communication within the care process, in its expanded sense, privileges the client through a relationship that is therapeutic, understood as an interactive and personalized process. Encompassing empathy, understanding, expressions such as priority to the elderly, respect, attention and active listening, which makes the holistic view the basis for humanized care.

Regarding the planning of care for the hospitalized elderly, it was found that it helps in the nurse's decision-making, in A1, welcoming is translated into actions, and that: "to be of quality, they cannot do without care planning, that is, the scientific methodology of Nursing, which is the Systematization of Nursing Care (NCS)". (DIAS et al, 2015, p.1839)

Studies A1 and A3 address that developing empathetic communication is not an easy process, due to the fact that people have different performance, affinities and characteristics when communicating. Communication is "a skill in which discipline is required from the professional and requires a change of focus and attitude. [...] moving from doing to listening, perceiving, understanding and identifying needs and only then planning care actions". (Dias et al, 2015, p.1844)

For the same reason, Gholamzadeh, et al (2018) highlight that:

> "Empathy is a teachable skill and policymakers in nursing education institutions are recommended to use the results of the present study and incorporate empathy skills training into undergraduate nursing education. This can serve to achieve two goals; reinforcing

> students' empathy towards older people and improving their attitudes towards older adults" (Gholamzadeh, et al, 2018, p.6).

In common, the three studies: A1, A2 and A3 point out as a strategy regarding the care of the elderly, that health professionals, a priori of Nursing - who are responsible for most of the time of care for the user, the process in professional training in the gerontological area, should contain proposals to face the gaps in care discussions within this area of knowledge, as well as in society in an assertive way.

AXIS 2: THE CONTRIBUTION OF THE NATIONAL HUMANIZATION POLICY TO HOSPITALITY IN THE CARE OF THE HOSPITALIZED ELDERLY

In this axis, the studies found dialogue about the aspects that permeate the humanization of care, the context in which the PNH was created, as well as the National Health Policy for the Elderly (PNSPI) necessary to guarantee the rights of this public. In addition, they point to nursing as the main promoter of the humanization of care, even though it is a multiprofessional challenge in the hospital environment.

Studies A4, A5 and A7 reveal that the focus on user embracement in health services, especially in relation to the elderly, has been awakened in recent decades, especially by the formulation of the PNH, in 2003. One of the main axes of the PNH is: welcoming. In which health actions constituted humanization exposes a way of caring, understanding, approaching, feeling and respecting the client in an integral way (ALVES, 2017).

In corroboration, study A8, in order to direct a new path for the practice of humanized care, some aspects stand out, among them, the professional, biological, social, cultural and spiritual aspects, which together promote humanized nursing care, according to the parameters of the PNH. (ANACLETO, CECCHETTO AND RIEGEL, 2020)

While article A6 understands within this scenario, the importance of the existence of the PNSPI – which, by establishing collective and individual health measures for the elderly population, in line with the principles and guidelines of the SUS: "aims to promote the recovery, autonomy and independence of the elderly. It underpins the action of the health sector in comprehensive care for the elderly and aging population." (SILVA, CARDOSO AND LINHARES, 2020, p.3)

Regarding the challenges of implementing humanized hospital care, defended in public policies, welcoming is still a challenge that comes up against the conformation of the hospital environment. In A4, we have to:

> "In the hospital environment, the historical development of the institution itself generated the technical-scientific and economic paradigm at the service of the human being, opposing humanized reception where the professional acts respecting the citizenship of users by providing them with dignity" (Silva, et al. 2018, p. 296).

The structuring of the work process within the hospital context brings to light contours that must be made to achieve the humanization of care. This implies facing an existing biomedical model, in which care is centered on the individual and not on the diseases, an individual who should have his or her integrality respected and valued. Study A6 points out that in those services where there is greater technological availability, such as Intensive Care Units, the nursing professional is constantly faced with the difficult work of harmonizing technologies and closer interaction with the patient. The overlapping of hard technologies can thus impact the construction of the space of humanized care (SILVA, CARDOSO AND LINHARES, 2020).

AXIS 3: HOSPITAL HOSPITALITY AND ITS POSSIBLE CONTRIBUTIONS TO HUMANIZED CARE FOR THE ELDERLY

In this axis, the studies found address relational technology, welcoming, empathetic treatment and holistic strategic actions of care and team awareness, such as the one that has been developed to bring hospital hospitality closer together. Although little discussed in scientific publications linked to the health of the elderly, hospital hospitality is an important component for the transformation of humanized care. The hotel industry sometimes permeates managerial actions, impacting the care sector, but without evidencing the relationship with this concept that is so positive for the performance of therapeutic care.

Articles A9 and A10 express that the hotel industry adapted to the hospital environment contributes to humanization, hospitality, customer reception and awareness of health professionals. "For this, it is necessary that hospital hospitality is recognized as an important and integral element of the health work process, even though it is still in transformation and development" (Marins and Slob, 2019).

Silva et al. (2019), aponta que:

> "In the means of accommodation, for a place to be considered hospitable, it is necessary that the manager, together with all employees, knows the needs and desires of guests and seeks to meet these issues in the most satisfactory way possible. In the case of hospital hospitality, the same principle must be followed aiming at emotional comfort, which makes the patient and their families feel welcome, with a comfortable and cozy place as far as possible, in a joint effort to offer the best for the client, both in intangible and tangible aspects" (Silva et al. 2019, p.3).

According to Guimarães (2007), hospital hospitality has grown in the country, in proportion to the fact that hospital institutions start to have, in addition to preventive, curative and therapeutic functions for the health of the community, the function of welcoming, providing comfort and well-being to the client. The services begin to adapt to environments similar to the structure of a hotel, composed of different types of services, with the objective of ensuring quality, efficiency, effectiveness and problem-solving capacity of customer service in health.

From this perspective, the "patient" is seen as a client, who has rights to be respected, no longer a passive body, and it is also up to him to understand the health information and procedures to be performed, including refusing procedures inherent to his treatment (Almeida, 2009). This fact denotes the importance of the expanded clinic that directs the user to co-responsibility for his therapeutic process.

CONCLUSION

Certainly, the realization of this integrative research evidences the importance of treating the humanization of care based on hospital hospitality, from the perspective of the health of the elderly, allied to the process of training in health and nursing.

The findings found make it possible to broaden new discussions on the theme, in addition to reaffirming its importance for care and care in gerontological nursing, contextualized from the pillars of humanization in hospital services.

It is up to nurses, during clinical practice in the gerontological area, to deepen their knowledge about the aging process, to expand the problem-solving aspect and critical thinking, in order to promote comprehensive care, in a humanized way, during the hospitalization process of the elderly.

In addition, this research generates data for the improvement and qualification of care with regard to the management of the work and care process in tertiary health care, in accordance with what is recommended by the WHO, with regard to the planning of the Decade of Healthy Aging (2020-2030), and also with the National Agenda of Health Research Priorities.

Although this study can point out important thematic excerpts for the deepening of the theme in question, there are limitations such as: scarcity of articles in the scientific literature on health, on the central theme: "Hospital Hospitality and the Humanization of Health Care for the Elderly", as well as the absence of terms related to Hospital Hospitality in the form of Health Sciences Descriptor.

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Creative approaches to undergraduate research

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Otaiza Josefina Cupare Castro[1], Gilberto Enrique Resplandor Barreto[2] and Aiskel Sabrina Andrade Mantilla[3]

ABSTRACT

Higher Education Institutions are par excellence centers of knowledge production, an activity that is generated from the substantive functions of Teaching, Research and Extension. This dialectical triad, duly interrelated, constitutes the foundation of its raison d'être. The purpose of this study was to contribute to the development of the culture of research at the Universidad Católica Andrés Bello, Guayana extension, enhancing the research skills of professors and students through the development of the Innovative Formulas for Undergraduate Research Project. The methodological approach was guided by Participatory Action Research, considering the need to progressively convert the organization into a research university, encouraging the participation of professors and students in the collective construction of knowledge, considering problematic situations of the environment, implementing actions to increase, through unconventional strategies, research at the headquarters. The project was developed over five semesters, with the participation of teachers and students from the eight schools. At the end of the 202415 semester, 85 professors participated and 114 products were materialized, which have been disseminated through various media, preferably in the institutional repository Saber Ucab, followed by publication in national and international journals and research conferences. The products obtained have contributed to demystify the belief that doing research from the classroom is difficult, producing satisfaction and obtaining more and better learning. The assessment of the experience by the university's Strategic Planning department reports great satisfaction and recognition, while the Academic Vice-Rectorate is urged to continue developing these activities.

Keywords: Innovative formulas, Research culture, Research professor, Research in the classroom.

[1] MSc., Centre for Regional Studies
Andrés Bello Catholic University
ORCID: 0000-0001-9776-3327
[2] Dr., Center for Regional Studies
Andrés Bello Catholic University
ORCID: 0000-0002-6993-7219
[3] Dr.., Center for Regional Studies
Andrés Bello Catholic University
ORCID: 0000-0002-1502-3825

INTRODUCTION

The Andrés Bello Catholic University (UCAB) is an institution of public service, of Christian inspiration and entrusted to the Society of Jesus. Its research, teaching and extension functions, as well as its management processes, are committed to the integral formation of the person, characterized by human and professional excellence and social commitment.

On the campus located in Guayana, the Center for Regional Studies (CER), under the direction of Dr. Aiskel Andrade, has been developing, since 2021, the Innovative Formulas for Undergraduate Research Project. The purpose of this is to encourage the culture of research at the headquarters, through the development of research competencies in teachers and students, from the research activities carried out in the different learning spaces, the generation of relevant and pertinent products, and the visibility and dissemination of the knowledge generated.

REFERENCES TO THE EMERGENCE OF THE PROJECT

The Institutional Training Plan of the Andrés Bello Catholic University (2013) defines competencies as "a dynamic, integrative and assessable set of knowledge, skills, abilities, values and attitudes that the student develops during his or her training and that the professional demonstrates in the social and labor scenario" (p.45). In this sense, the development of teaching, research and extension processes aligned with the purpose of developing competencies in students is proposed.

Particularly in terms of research, at the UCAB it is assumed:

> … as a way of generating knowledge it is an activity of the university, a means and a substantive part of the curriculum. In addition, it must be relevant and innovative, governed by deontological principles, open to all currents of thought, based on contemporary knowledge, and be able to be basic, theoretical and applied; integrated into comprehensive training; it motivates its actors in a critical and comprehensive attitude, promoting dissemination mechanisms inside and outside the university. (PFI, pp. 52-53).

Hence, among the research policies, it establishes the promotion and stimulation of members of the academic community for the development of research, favoring the formation of multidisciplinary teams.

Another reference to consider is referred to in the 2023 Plan of the UCAB (UCAB 2023) in which, for the Connect axis, it presents as a strategic objective the deepening of research and transfer processes, improving the platforms and capacities that allow the development of relevant, useful research work that affects the solution of the problems and needs of today's society. In this order of ideas, it establishes as strategic initiatives the proposal of a training program for the development of research competencies, aimed at both academic staff and students.

Additionally, among the special challenges for Guayana, the need to design research projects aimed at obtaining means to finance their execution was established, as a strategy to generate financial resources for the university.

Based on the challenges for Guayana, with the reference of the special plan for the promotion of postgraduate research proposed among the *Strategy for the Improvement of Postgraduate Studies* (UCAB, 2019), the development of the project Innovative Formulas for Undergraduate Research was established as a strategic initiative, under the coordination of the Center for Regional Studies.

The development of the project applied in the Guyana Extension was aimed at promoting the culture of research through the incentive to the development of research competencies, from research activities linked to teaching and learning in all disciplines, the generation of relevant and pertinent products, and the dissemination of knowledge. All this in order to achieve greater projection of the university inside and outside the walls, which could result in the generation of products and services that could generate resources for the institution.

THEORETICAL CONSIDERATIONS

The **university** is an institution that plays important roles for human, regional, and sustainable development in contemporary society. Its primary function is to ensure that its graduates are able to acquire new knowledge and apply it to social reality, ensuring that it is accessible to all society, at all social levels so that there is social inclusion, exercising both a social and political function, being able to return the investment they receive from the community through the development of studies, research and social extension projects, compatible with the real needs of the population for the common welfare, that is, they must contribute to solving the current problems of society. Also to ensure **that students obtain a formulated and critical opinion regarding the social reality in which they must interact so that there is scientific, technological and cultural progress. (Bilski, n.d.)**

Universities, in order to achieve the purposes aimed at the creation, production and dissemination of scientific, humanistic and technological knowledge, need to have dynamic governance systems and sufficient means to promote adaptations to the requirements of the Knowledge Society, represented by globalization, the development of ICTs, uncertainty, complexity, inter- and transdisciplinarity.

A main function of universities is the management of knowledge in professors and students, which is promoted, from the action of professors, learning to learn, from the development of teaching skills to teach to learn from their permanent interest in learning to teach. The other function is related to the production of knowledge from research, which implies having the capacity to promote new

and innovative knowledge, based on the recognition that the teaching-research relationship is the driving force of university activity.

University teaching must be exercised in close relationship with research, for this reason universities must promote research activities in students from the beginning in professional training programs, for this they must have professors who are not only dedicated to teaching but, based on the disciplinary knowledge they possess and the experience acquired in professional practice, be able to articulate theoretical knowledge with practical knowledge so that students acquire better training. Teachers, by assuming their teaching practice from this perspective, transmit to their students not only theoretical knowledge related to concepts, theories, principles and characteristics, but also criteria, orientations, trends and doubts, which cultivate amazement, encourage creativity and promote the search for meaningfulness in learning.

Research should be the basis of university education, because it teaches critical thinking, understanding, dissent, arguing and creating new information, knowledge and technologies. It enables the training of professionals with creativity, willing to innovate, create and recreate the acquisition of knowledge from the intellectual, psychomotor cognitive and affective cognitive aspects. It is important to highlight that the knowledge, information and technologies generated through research play a great role in the integral development of the country; therefore, there should be greater coordination between the various instances of higher education institutions with organizations, companies and public and private instances.

Research, in general, has become one of the bases for evaluating universities. It must be encouraged and valued, without pressuring researchers to do *useful or profitable* science.

ROLE OF THE TEACHER

In the opinion of Padilla Zamora (2016), the pedagogical strategies of undergraduate teachers should be aimed at providing students with the tools so that, based on research, they can carry out interventions in their environment. These tactics must include individual and group advice, tutorials, collaboration, cooperation, consultation and debate from a constructive point of view, forging research to identify, describe, characterize, explain and understand the different phenomena and offer answers to problems of different nature.

Additionally, as fundamental aspects in training, collaborative work, self-learning, respect for others, tolerance, co-responsibility, ethics and systematization should be promoted in students, as a basis and starting point for the resolution of real problems in professional life, which will provide them with significant learning, by awakening their vocational interest in solving them.

Morales, Rincón & Romero, 2005 (c.p. Padilla Zamora, 2016) provide a theoretical-methodological proposal that can contribute to students learning about research and researching: a)

reading research on published related areas; b) make conceptual presentations on the research process, seen globally, as a system; c) accompany the researcher in the research process; d) teach research by investigating; (e) research in and with the community; f) writing as a recursive process of collaboration in the research process; (g) to carry out meaningful research; h) formative evaluation; (i) teaching by example; j) disseminate information on the lines of research; k) Maintain an assertive teacher-student relationship in the research process.

THE TEACHER AS RESEARCHER IN THE CLASSROOM

The teacher, when deploying his teaching action, mediates and regulates between theory and practice. This reconciliation is carried out through a double process, on the one hand, from the cognitive level, they have knowledge of their discipline and, in view of the curricular contents, they value and interpret the information from their own knowledge schemes, and decide what is pertinent for teaching. On the other hand, he acts as a reflective practitioner, who constantly makes decisions about his performance, which is influenced by emotional, cognitive and attitudinal variables. "This double dimension... it shows the importance of making explicit their schemes of professional knowledge and analyzing their relationship with their performance in the classroom." (Porlan & Martin, 1999, pp. 15-16)

In order to promote and coordinate research in the classroom, the teacher identifies and diagnoses problems, questions reality, raises hypotheses, plans intervention in different contexts, designs strategies, selects and applies methods, techniques and tools to obtain information whose analysis leads to responding to the concerns raised.

ROLE OF THE STUDENT RESEARCHER

The generation of research skills in university students mainly originates through the articulation of previous knowledge, the theoretical foundations provided by professors, the identification of needs and demands of the profession and the environment, "from the reinforcement of scientific capacities from a humanistic point of view and the acquisition and application of technological tools, from a multidisciplinary, trans and intradisciplinary vision, which allows the student to have a holistic training." (Padilla Zamora, 2016, p. 22.)

According to Sierra Pérez (2011), "the economic success or failure of a nation no longer depends on the technology or machinery it possesses, but on what it does with its people" (n.p.). If this thinking is transferred to the field of university education, the development of research skills in students should stimulate critical thinking, self-management, encourage teamwork, argumentation, the spirit of help and collaboration and the search for solutions to the problems of reality with creativity and innovation.

In the opinion of Calderón, Hernández, and Villalobos (2011), university students should:

a) Make decisions. Individual and group and be active agents of their own learning;

b) Discover the phenomena to be studied, reflect on their own ideas and concepts to achieve an understanding of the world and begin to enjoy, predict and generate their own new knowledge;

c) Work collaboratively;

d) Provide constructive criticism about their work and that of their classmates;

e) Participate in the deconstruction of knowledge and co-construction of new knowledge while generating learning situations that develop their capacities and attitudes to accept and weigh evidence and,

f) Transfer and apply the knowledge acquired to new experiences, that is, develop skills to apply the knowledge achieved in other contexts or situations.

In short, it is necessary for both teachers and students to form a bond that promotes research at the university. In most institutions there are specialized centers that provide support to the research that is carried out and also have research policies that guide and protect the work that is carried out there. (Giménez, 2017).

INNOVATIVE FORMULA FOR UNDERGRADUATE RESEARCH

To construct an approximation to the definition of Innovative Formulas for Undergraduate Research, the following considerations were made about the meaning given to the words Formula, Innovation and Research.

A Formula is understood to be any pattern or rule on the following of which the solution of a matter depends. *A formula is a conventional practical method or procedure that, based on certain symbols, rules, steps and/or values, allows problems to be solved or processes to be executed in an orderly and systematic manner, in order to obtain a specific and controlled result*

Innovation is defined by the practical or useful purpose that it brings to obtain or develop processes or products different from those established... it refers to what is new in the practical context in which it is developed, leading to immediate applications. Innovation can also be conceived as the production of things, the same or different, but changing the methods of production.

To specify the term investigation, the synonyms of the term are used: inquiry, inquiry, inquiry, search, inquisition, exploration.

Based on the previous exposition, Innovative Formulas for Undergraduate Research will be understood as the practical and systematic procedure for the application of unconventional research strategies, promoted and coordinated by teachers, with the participation of students, aimed at solving problematic situations, evidenced in learning spaces and in the surrounding reality.

The Innovative Formulas for Undergraduate Research project conceives six alternative formulas from which the teacher can choose which one to apply, taking into account the characteristics of the subject, considering the general and specific competencies to be developed, the programmatic content, the didactic strategy contemplated; in addition to the willingness of the students to participate in the project.

The Innovative Formulas for Undergraduate Research referred to are: Undergraduate Pulse, Case Study, Classroom Research, Debates for the Public, Expert Vision and Sandbox.

It should be noted that the original project, proposed for postgraduate studies at the Caracas campus, proposed the formula called Classes of postgraduate students. This consisted of the participation of postgraduate students as guest professors in undergraduate chairs. At the suggestion of the School of Computer Engineering, of the Guayana campus, the SandBox was incorporated to replace the aforementioned formula.

The six innovative formulas to be selected by teachers to apply and the expected products are described below:

- **Undergraduate pulse:** refers to current reports on the practices carried out by Venezuelan organizations. It includes data on key management areas for the competitiveness of organizations, such as social networks, compensation, technology, labor aspects, among others. The minimum desirable product must reflect current information on the practices carried out by organizations based in the Guayana region, in areas of knowledge associated with the selected subjects. The presentation of the product may be made graphically, through tables or graphs.
- **Case studies:** consists of the documentation of case studies that describe the experiences of Venezuelan organizations considering specific aspects, as well as business success stories. The minimum desirable product must present successful experiences of organizations based in the Guayana region, in a specific topic associated with the contents of the selected subject. The presentation of the product may be made in a document that includes the description of the case and the instructions for its approach.
- **Research in the classroom:** involves the development of empirical or bibliographic research, through fieldwork or the construction of a theoretical framework or state of the art. The minimum desirable product must refer to the collection, processing and analysis of data, based on the application of techniques and instruments. The presentation may be made by means of a research note, research report or graphic presentations.
- **Debates for the public:** consist of the identification of specific relevant and current topics for a lecture, which are developed by the students, guided by the professor; with a previously defined methodology. The minimum desirable product will be the

documentation or recording of the activity that may be presented in a document or a recording published on a platform

- **Expert vision:** accounts for the application of in-depth interviews with experts on topics relevant to the subject, with a guide or specific guidelines for its development, and duly documented in a publishable format. The minimum desirable product will be evidence of the interview in a document or recording.
- **Sandbox:** consists of the creation of technological solutions, with projects in the area of information and communications technology (ICT) and Artificial Intelligence. They refer to proposals for algorithms to solve problems or illustrate processes, proposals for degree projects, construction of theoretical frameworks or state of the art. It involves interdisciplinary teamwork and the achievement of goals beyond a school of affiliation and the duration of a semester. The minimum desirable product will be the computer algorithm.

DESCRIPTION OF THE PROCESS OF APPLICATION OF INNOVATIVE RESEARCH FORMULAS

PROJECT IMPLEMENTATION

The execution of the Innovative Formula for Undergraduate Research Project, in the Guayana extension, began in July 2021, with the adaptation of the project originally created for the postgraduate program at the Caracas campus. Between July and August of the aforementioned year, it was presented to undergraduate schools and has been applied during the 2022-15, 2022-25, 2023-15, 2023-25 semesters and is being implemented in 2024-15.

The experiences are developed in three phases: planning, execution and evaluation. In the first phase, planning, activities have been carried out prior to the start of each semester: promotion of the project through visits to the school directors, who are involved in the start of the process; contact with all active teachers for the semester, separated by the school of affiliation, emphasizing those suggested by the directors; presentation of the project and the roadmap for the semester to the professors who expressed their interest in participating; and consolidation of the group of participating teachers.

The implementation phase, which corresponds to the application of the selected formula, is represented in the roadmap drawn up for this purpose. It begins with the selection of a curricular unit by the teacher who expresses his or her willingness to join. This is followed by the review of topics and contents of at least one of the subjects attended, in order to choose the one that allows the development of research activities. Next, the selection of the innovative formula to be applied is declared. Then, the lesson plan of the subject is designed, including the activity to be carried out that

will allow the consolidation of the minimum expected product. The execution of the work plan is reported through progress reports submitted to the CER.



During this period, teachers and students receive the accompaniment and advice of the operational managers of the project. It is important to mention that, depending on the formula selected, the execution can be carried out during the semester or at a particular time; it can even take more than a semester. At the end of each semester, participating faculty are expected to formally deliver the consolidated product. In order to guide the consolidation of products, a document was prepared that presents general provisions.

The last phase, the evaluation, includes the evaluation by the operational managers of the consolidated products presented by the participating teachers, with the subsequent recommendations for dissemination.

IDENTIFICATION OF ALTERNATIVE MEANS OF DISSEMINATION OF THE PRODUCTS GENERATED

The suggested platform for the publication of the final products obtained by applying the selected formula is the institutional repository Saber UCAB, as it is the space par excellence to share the intellectual production of the members of the UCAB community.

Additionally, from the Center for Regional Studies, the Observatory of the Guayana Region and the Revista Guayana Moderna are offered as alternatives, depending on the quality of the products and compliance with editorial standards. This without detracting from other means of dissemination selected by the professors, according to their purposes, thematic area and characteristics of the product conceived.

VALUATION OF GENERATED PRODUCTS

The assessment of the products generated is applied by the operational managers of the project in accordance with the indicators described below: A) Relevance: refers to the fact that the product shows that it is adapted to the objective, and that it evidences the development of the associated competencies. B) Relevance: implies that the content is significant and important, that it is

associated with real or simulated situations. C) Adequacy: indicates that the expected product is associated with the selected innovative formula.

EXPERIENCES OF APPLYING INNOVATIVE RESEARCH FORMULAS IN UNDERGRADUATE STUDIES

FIRST EXPERIENCE: SEMESTER 2022-15

The first experience was carried out between October 2021 and February 2022. 14 teachers participated, attached to the schools of Administration and Accounting, Social Communication, Law, Education, Computer Engineering and Industrial Relations. The list of participants by schools, the selection of innovative research formulas to be applied and the products delivered are reflected in Annex 2. The innovative formulas selected were classroom research, expert vision and sandbox. The products generated were 15.

SECOND EXPERIENCE: SEMESTER 2022-25

This second experience of the project took place between the months of April and August 2022. 18 professors participated, some of whom continue the project of the previous semester. The participating professors represented the schools of Administration and Accounting, Social Communication, Education, Civil Engineering, Computer Engineering and Industrial Relations. The innovative formulas selected were classroom research, expert vision and sandbox. The details are set out in Annex 3. 20 final products were generated.

THIRD EXPERIENCE: SEMESTER 2023-15

The third experience of the project was implemented between October 2022 and February 2023. The new group was made up of 15 teachers. The participating professors represented the schools of Administration and Accounting, Social Communication, Law, Education, Civil Engineering, Computer Engineering and Industrial Relations. The innovative formulas selected were classroom research, expert vision, sandbox and debate for the public; as shown in Annex 4. As a result of the experience, 21 products were consolidated.

FOURTH EXPERIENCE: SEMESTER 2023-25

The fourth experience of the project was implemented between March and July 2023. The schools of Administration and Accounting, Social Communication, Law, Civil Engineering, Industrial Engineering, Computer Engineering, Industrial Relations and the Chair of Identity and Mission were represented. The innovative formulas selected were classroom research and sandbox (see annex 5). As a result of the experience, 40 products were consolidated.

FIFTH EXPERIENCE: SEMESTER 2024-15

The fifth experience of the project began in September 2023 and will conclude in January 2024. It is hoped that by February we will have the data associated with the participation of teachers.

ANALYSIS OF THE RESULTS OF THE EXPERIENCES DEVELOPED

FIRST EXPERIENCE: SEMESTER 2022-15

The development of the first experience reported the following results: the schools with the highest participation were Industrial Relations, Computer Engineering and Education; The teachers of these schools were found to be most willing to participate in this first one. Research in the classroom prevailed as a selected innovative formula. Research reports accounted for 80% of the products and the most widely disseminated platform was Saber UCAB.

Figure 1. Teacher Participation by School

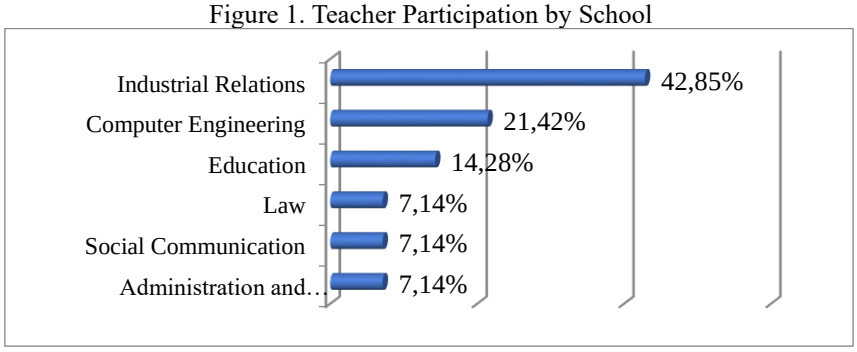
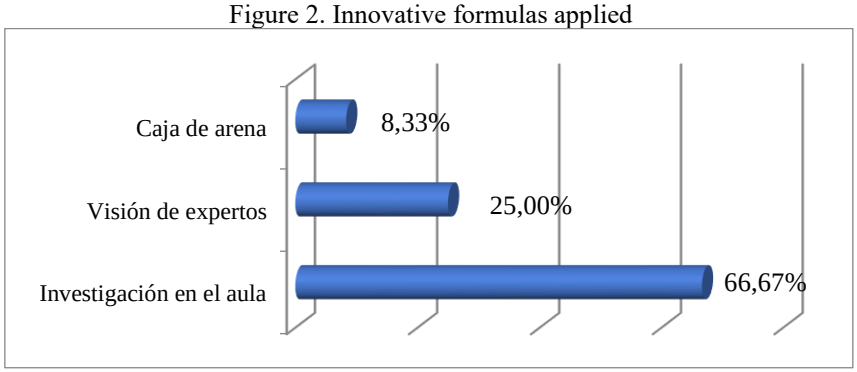


Figure 2. Innovative formulas applied



Secondly, the publication of two articles in two university journals (carried out by professors with experience in the publication of articles) and a considerable percentage of unpublished products can be seen; the latter was perhaps due to the lack of knowledge of the diversity of options and opportunities offered by the Saber UCAB repository to disseminate the product of the work generated in the classrooms.

Figure 3. Consigned products

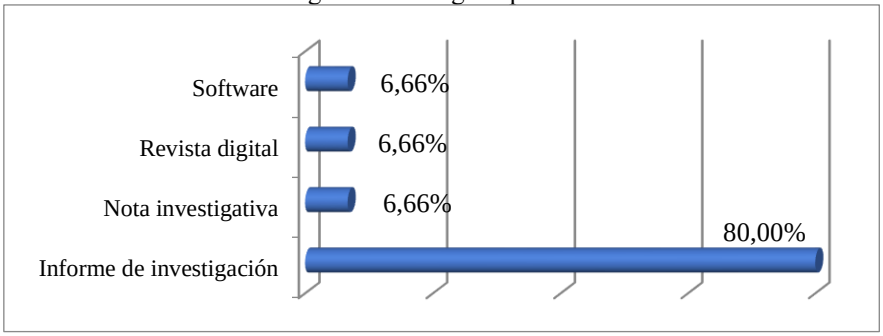
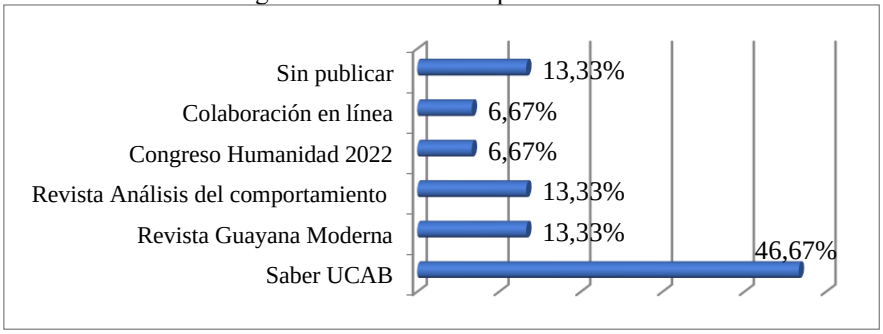


Figure 4. Dissemination platforms used



SECOND EXPERIENCE: SEMESTER 2022-25

The schools with the highest participation in the second experience were Computer Engineering and Social Communication, followed by Education and Administration and Accounting. Research in the classroom is repeated as the greatest innovative formula selected by teachers.

Figure 5. Teacher Participation by School

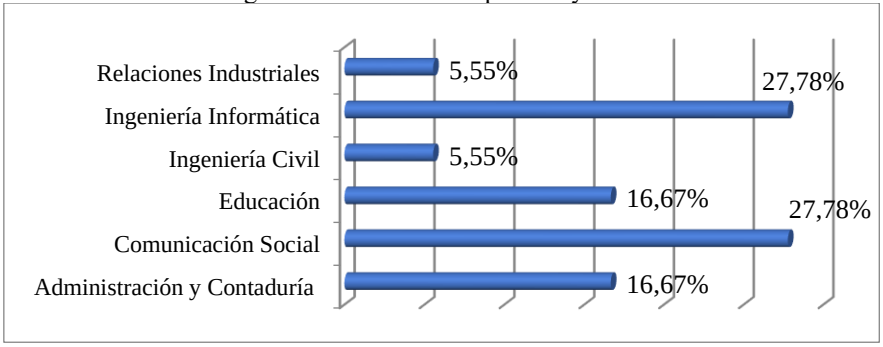
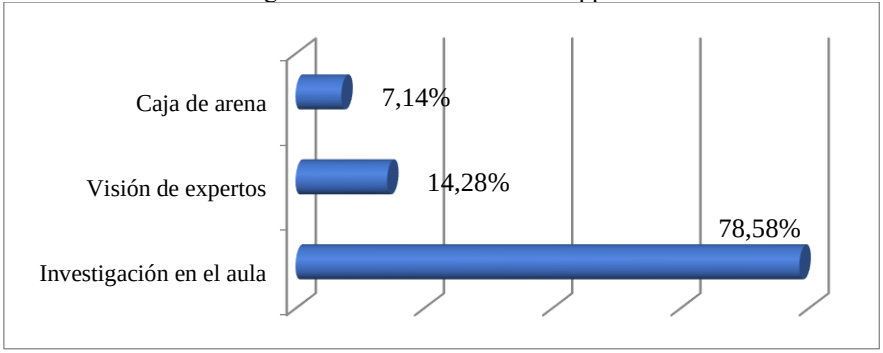


Figure 6. Innovative formulas applied



As the variety of products that Saber UCAB allows to be incorporated is known, the research reports represent the largest percentage of products; but PowerPoint presentations represent a considerable number of contributions.

Graph 7. Consigned products

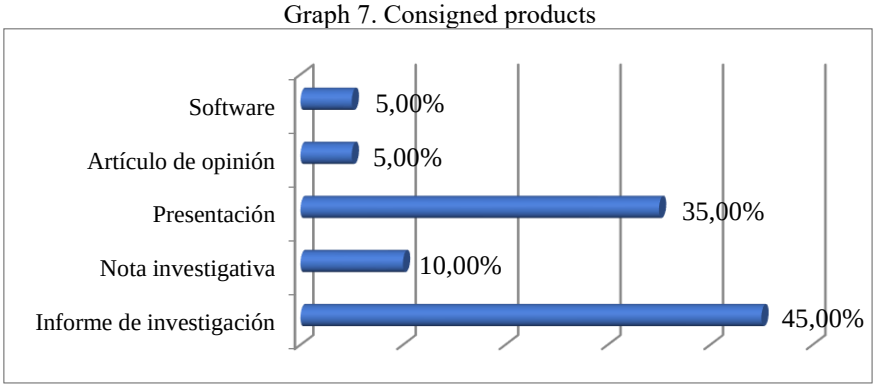
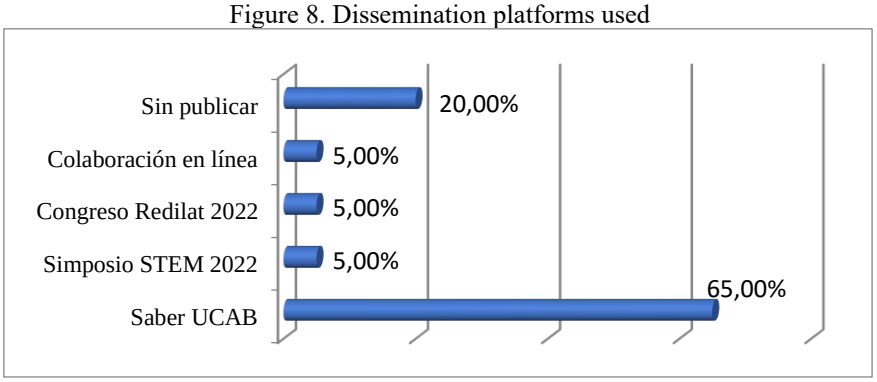


Figure 8. Dissemination platforms used



THIRD EXPERIENCE: SEMESTER 2023-15

As a result of the third experience, the schools of Computer Engineering, Administration and Accounting, and Social Communication belong to the largest number of professors who participated. Civil Engineering is incorporated into the spectrum of schools. Research in the classroom continues to lead as a selected innovative formula and research reports and Saber UCAB constitute the largest volume of products and the greatest possibility of dissemination.

Figure 9. Teacher Participation by School

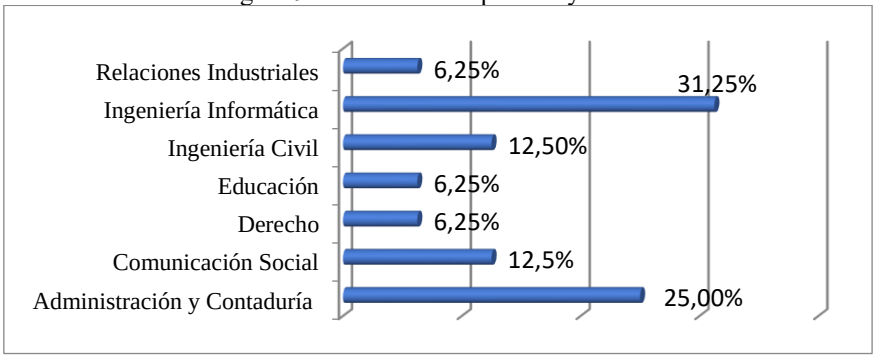
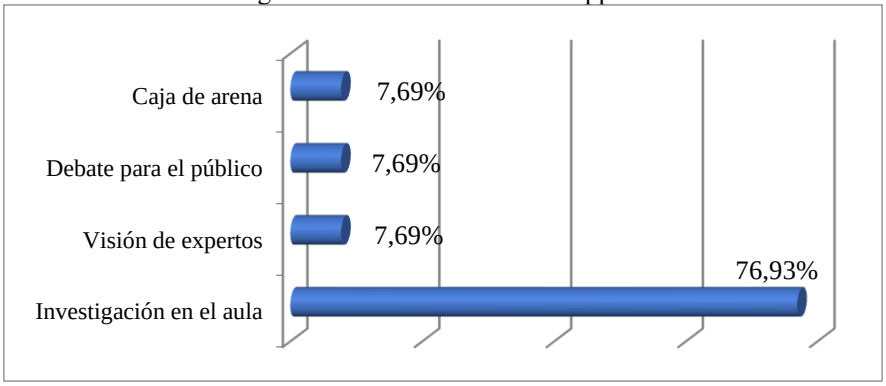
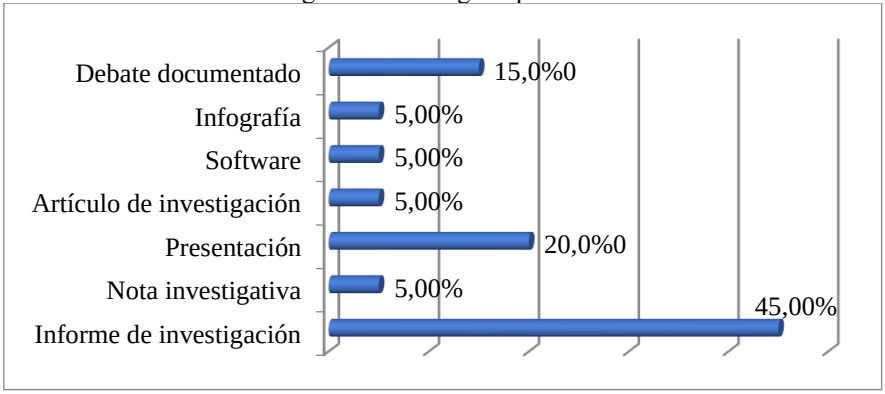


Figure 10. Innovative formulas applied

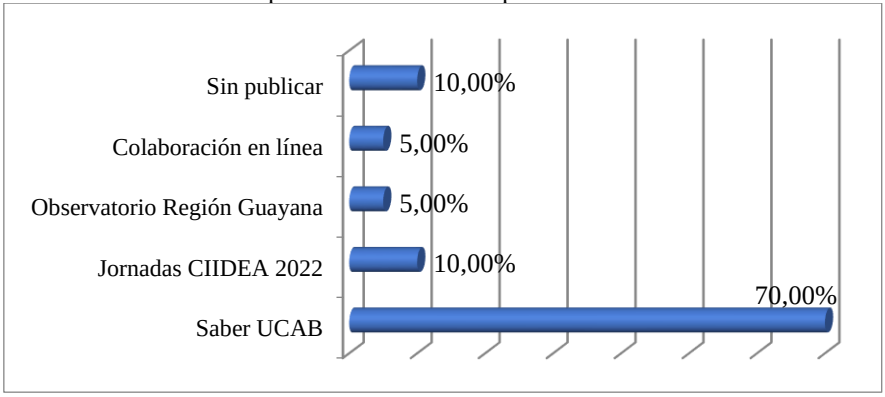


It is worth mentioning that some products generated during this semester provided information for the Observatory of the Guayana Region and served as inputs to participate in the IV CIIDEA 2022 Conference. These last two means of dissemination allow greater visibility to the research activities carried out by teachers and students in learning spaces.

Figure 11. Consigned products



Graph 12. Dissemination platforms used



FOURTH EXPERIENCE: SEMESTER 2023-25

In the fourth experience, it can be seen according to graph 13 that Computer Engineering, Administration and Accounting and Social Communication maintain the leadership in participation, Civil Engineering continues; but Industrial Engineering and Law are incorporated.

Graph 13. Teacher Participation by School

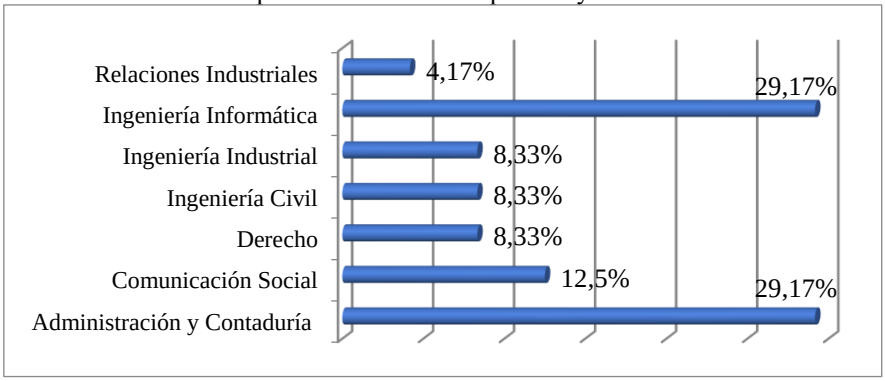
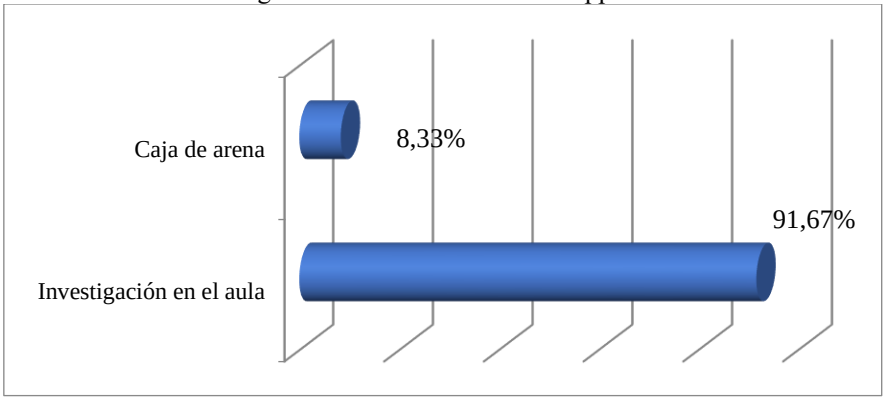


Figure 14. Innovative formulas applied



Classroom research continued to be the most widely used formula, and in terms of contributions, research reports, presentations, and infographics make the biggest contributions. As for the dissemination of the products, it stands out in 90% without publication.

Graph 15. Consigned products

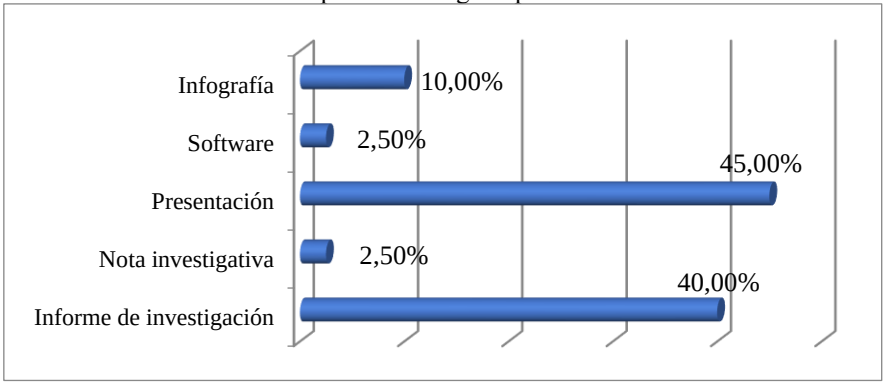
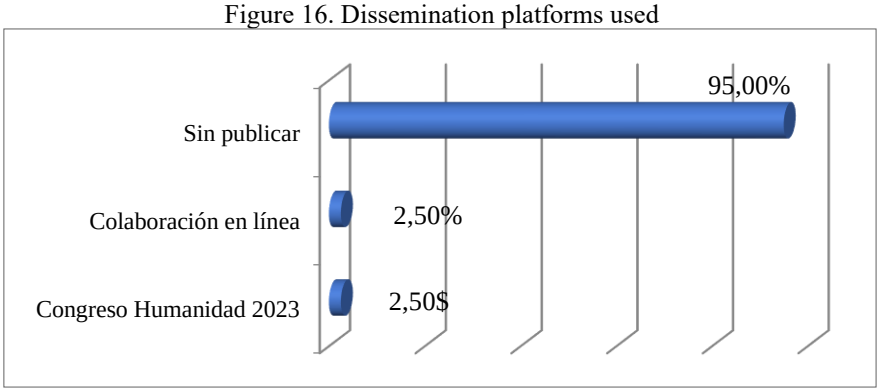
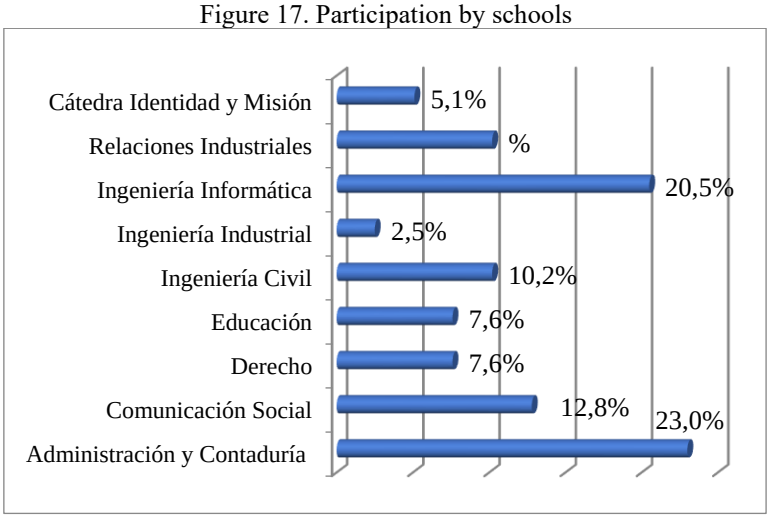


Figure 16. Dissemination platforms used



The Innovative Formulas for Undergraduate Research Project has been fully applied over four semesters (2022-15 to 2023-25). 39 teachers participated. Some have remained in the project in each of the semesters. There has also been the case of teachers who have participated representing two different schools. The school with the highest representation was Administration and Accounting (23.0%), followed by Computer Engineering (20.5%).

Figure 17. Participation by schools



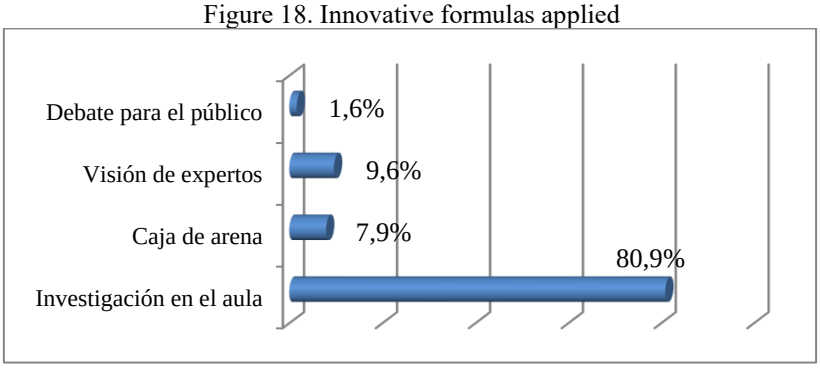
It is significant to consider the proportion of participants in the project, differentiated by school, given the variability in the number of active teachers during the four semesters referred to. From this perspective, it is possible to observe that the participation of the professors attached to the School of Computer Engineering is the most significant.

Table 1. Proportion of participants per school

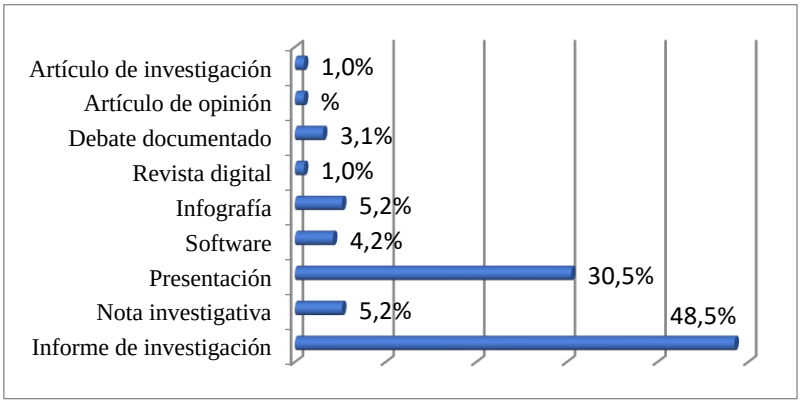
School	Number of teachers							
	202215		202225		202315		202325	
Administration and Accounting	46	2,17%	44	6,81%	43	9,30%	45	15,55%
Social sciences	22	27,27%	14	7,14%	11	9,09%	7	14,28%
Social Communication	58	1,72%	53	9,43%	52	3,84%	48	6,25%
Education	20	10,00%	23	13,04%	9	11,11%	2	0,00%
Right	36	2,77%	34	0,00%	35	2,85%	35	5,71%
Civil engineering	26	0,00%	22	4,54%	22	9,09%	21	9,52%
Computer engineering	17	17,64%	17	29,41%	17	29,41%	18	38,88%
Industrial Engineering	21	0,00%	22	0,00%	18	0,00%	20	10,00%
Engineering Common Subjects	16	0,00%	15	0,00%	12	0,00%	13	0,00%
Total	**262**		**244**		**219**		**209**	

When referring to the innovative formulas applied by teachers, it is observed that the most frequent was research in the classroom (80%), followed by expert vision (9%), sandbox (7%) and debate for the public on only one occasion.

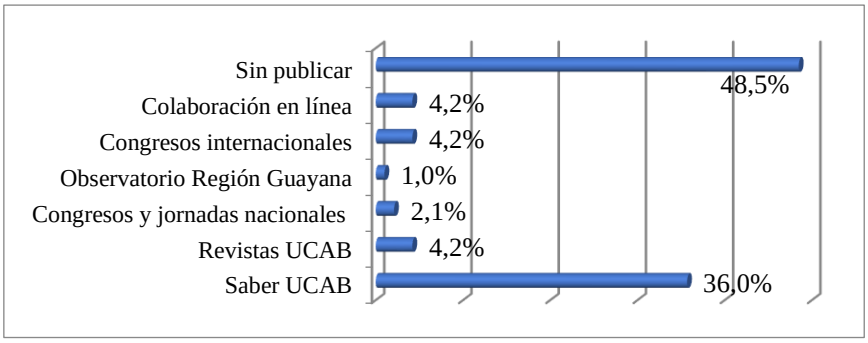
Figure 18. Innovative formulas applied



During those semesters, 95 products were generated, of which research reports were the most presented (48%), followed by presentations (30%), infographics and research notes (5% each), software (4%) and other types of products (6%).



Finally, it is important to refer to the publication of the products generated between the 2022-15 and 2023-25 semesters. On UCAB platforms, 41.2% are available; 6.3% have been presented at national and international conferences and congresses. However, 48.5% have not yet been published.



REFLECTIONS ON THE EXPERIENCES DEVELOPED

The development of the Innovative Formulas for Undergraduate Research Project for five consecutive semesters allows us to reflect on the lessons learned. It is possible to identify good practices and challenges to enhance the project, in relation to the purpose for which it was designed, to encourage the culture of research at the Guayana headquarters.

GOOD PRACTICES

REGARDING THE DEVELOPMENT OF RESEARCH COMPETENCIES IN TEACHERS AND STUDENTS, FROM THE RESEARCH ACTIVITIES CARRIED OUT IN THE CLASSROOMS

- The conceptualization of the project, the definition of the expected products and the identification of alternative means of dissemination to provide references for the formulas to be selected and the strategies to be applied.
- The design of the guidance guide for the development of the minimum expected products per formula applied.
- The promotion of the project with presentations to school directors and teachers of the headquarters in mixed modality, both face-to-face and virtual, through the Zoom platform.
- The strategies implemented to encourage teachers, which allowed the significant increase in the number of participants in each semester, among which it is possible to mention: visiting schools, requesting principals and academic coordinators that, after reviewing the lesson plans, identify those teachers who declared the realization of research activities as part of the strategies for development. Without detracting from the carrying out of research activities, and the obtaining of products, even if they have not been planned.

- The strategies of accompaniment to the teachers, in the conception of the minimum expected products and in the evaluation of the products, monitoring the development during the semester until consolidation. Among them: individual and group counseling; the sending of support material; meetings with specialists to meet the special needs of some of the participants.
- The orientations, from the beginning of the semester, to the directors of the schools, to the academic coordinators and to the professors assigned to them, ensuring that the professors were able to understand the purpose of the project and identify the activities contemplated in their lesson plans, associated with the research processes that they have been developing with their students.
- The active participation of the students, who, under the coordination of their professors, carried out research activities, such as the design and application of data collection instruments, data analysis, product design, including presentations, digital magazine, and survey management software with geolocation, created by students in the sandbox.
- Holding meetings with school principals to present the adjustments made, the results obtained, and to request the identification of potential participants based on the review of the research activities declared by the professors in the lesson plans of the previous semester.

REGARDING THE GENERATION OF RELEVANT AND PERTINENT PRODUCTS

- The definition of the minimum expected outputs per formula applied; this given that not all professors intend to conceive research reports or articles for peer-reviewed journals.
- The generation of research products that have been applied by units of the university. Among them: the software for the management of surveys called UCAB Forms 2.0, created by the Computer Engineering team, and used by the Center for Regional Studies, and some professors, for the collection of data from several of the projects it executes.
- The development of workshops for the writing of scientific and academic articles and publication in Saber UCAB, aimed at the teachers of the headquarters.
- Activities carried out to stimulate students, such as visits and taking photographs in the classrooms, in order to leave evidence of their participation.

REGARDING THE VISIBILITY AND DISSEMINATION OF THE KNOWLEDGE GENERATED

- The significant contribution of the project to the academic community by publishing the products on different UCAB platforms, such as Saber UCAB and the journals Guayana Moderna and Analogías del behavior.
- The participation of teachers in national and international conferences and congresses. Among them: Conference of the Center for Research, Innovation and Academic Development; Science , Technology, Engineering and Mathematics Symposium 2022; Humanity Congress 2022; Latin American Researchers Network Congress 2022.

RECOMMENDATIONS TO ENHANCE THE PROJECT

To promote the Innovative Formulas for Undergraduate Research Project, it is recommended:

- The selection of participating teachers from the schools, identifying in their lesson plans opportunities to encourage research with their students, to generate knowledge that can be shared with their peers.
- The materialization of the workshops on Saber UCAB and the Harvard Method for case studies.
- The enabling of the Saber UCAB platform to carry out file uploads.
- To promote the recognition of students participating in research activities and to reward outstanding products.

FINAL CONSIDERATIONS

The Innovative Formulas for Undergraduate Research Project, during the five semesters in which it has been applied, has made it possible to advance in the proposed objective. To date, 39 teachers representing all schools have participated in the project; four of the innovative formulas proposed in the project have been applied; 95 research products have been submitted by teachers; and the products have been disseminated in various media.

It is possible to point out that significant progress has been made in the development of research competencies in teachers and students, and the production of knowledge from the research carried out in the classrooms, with the work in teams made up of teachers and their students. As well as the generation of products that contribute to making visible the generation of knowledge in the UCAB Guayana through institutional platforms, such as Saber UCAB, the Revista Guayana Moderna, the Revista Analogías del Conducta and the Observatory of the Guayana Region.

A greater participation of professors, representing all schools, is aspired in order to continue promoting the development of the culture of research in the University. The Centre for Regional

Studies will continue to participate in the promotion of the culture of research by programming and carrying out activities that contribute to the achievement of the declared purpose of the project.

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Quality of life and its representations for people living with HIV: Consensus and dissent

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Yndira Yta Machado[1], Denize Cristina de Oliveira[2], Sérgio Corrêa Marques[3], Rodrigo Leite Hipólito[4], Antônio Marcos Tosoli Gomes[5], Tadeu Lessa da Costa[6], Thelma Spindola[7], Jessica Grativol Aguiar Dias de Oliveira[8], Gláucia Alexandre Formozo[9], Hellen Pollyanna Mantelo Cecilio[10] and Renata Lacerda Marques Stefaisk[11]

[1] Doctor in Nursing
Institution:State University of Rio de Janeiro
Address: Rio de Janeiro – Rio de Janeiro, Brazil
E-mail: yndiramachado@gmail.com
ORCID: https://orcid.org/0000-0003-0692-7299
[2] Doctor in Nursing
Institution:State University of Rio de Janeiro
Address: Rio de Janeiro – Rio de Janeiro, Brazil
E-mail: dcouerj@gmail.com
ORCID: https://orcid.org/0000-0002-0830-0935
[3] Doctor of Nursing
Institution:State University of Rio de Janeiro
Address: Rio de Janeiro – Rio de Janeiro, Brazil
E-mail: sergiocmarques@uol.com.br
ORCID: https://orcid.org/0000-0003-2597-4875
[4] Doctor of Nursing
Institution:Fluminense Federal University
Address: Niterói – Rio de Janeiro, Brazil
E-mail: professorrlh@uol.com.br
ORCID: Orcid: https://orcid.org/0000-0002-2439-7626
[5] Doctor of Nursing
Institution:State University of Rio de Janeiro
Address: Rio de Janeiro – Rio de Janeiro, Brazil
E-mail: mtosoli@gmail.com
ORCID: https://orcid.org/0000-0003-4235-9647
[6] Doctor in Social Psychology
Institution:Federal University of Rio de Janeiro
Address: Macaé – Rio de Janeiro, Brazil
E-mail: tadeulessa@yahoo.com.br
ORCID: https://orcid.org/0000-0003-2771-5551
[7] Doctor in Nursing
Institution:State University of Rio de Janeiro
Address: Rio de Janeiro – Rio de Janeiro, Brazil
E-mail: tspindola.uerj@gmail.com
ORCID: https://orcid.org/0000-0002-1785-5828
[8] Master of Science in Nursing
Institution:State University of Rio de Janeiro
Address: Rio de Janeiro – Rio de Janeiro, Brazil
E-mail: jessicaygrativol@gmail.com
ORCID: https://orcid.org/0000-0003-4646-7047
[9] PhD in Social Psychology
Federal University of Rio de Janeiro
[10] PhD in Nursing
Federal University of Mato Grosso do Sul
[11] PhD in Nursing
Rio de Janeiro State University

ABSTRACT
Objectives: to analyze consensus and dissent from social representations of the quality of life of people living with HIV in medium and large municipalities. Methods: qualitative research, supported by the Theory of Social Representations - processual approach. A total of 68 people living with HIV participated in the study. A characterization questionnaire and semi-structured interviews were used. Analysis performed by SPSS and Iramuteq software. Results: Consensus refers to the perception of quality of life, family relationships and prejudice. Medium-sized municipalities perceive quality of life based on knowledge about the disease, the process of adaptation to ART, sexual practices and social and family support. Larger municipalities, on the other hand, refer to life habits, physical activity, family and the normalization of daily life. Final Considerations: differences in the social representations of quality of life were observed in the two groups analyzed, referring to cultural and socio-historical constructions typical of the ways of life and relationships experienced by the groups studied.

Keywords: Quality of life, HIV, Acquired Immunodeficiency Syndrome, Lifestyle, Social representation.

INTRODUCTION

In Brazil, the Human Immunodeficiency Virus (HIV) was first identified in the early 80s, with cases reported in the cities of São Paulo (1980) and Rio de Janeiro (Valadão et al., 2022). In the following years, the epidemic showed significant geographic expansion, reaching all regions of the country in a heterogeneous way (Agostini et al., 2019).

Despite the recognition that the increase in survival time positively influences people's lives, it is understood that this factor alone is not directly related to the improvement in the quality of life (QoL) of people living with HIV, since the diagnosis implies changes in various aspects of life, such as sexual, emotional and social. Thus, when discussing QoL in a broader way, it is necessary to understand it as a dynamic and changeable process, which includes the continuous interactions between the individual and the environment, therefore, socioeconomic, demographic, cultural, psychological, and spiritual conditions are intrinsic factors in this assessment (Marques et al., 2020).

Quality of life has become a useful variable to determine the global impact of diseases and health treatments from the perspective of the individual. Its measure is potentially useful for application in clinical and psychosocial research to demonstrate the possible benefit and impacts of therapeutic interventions (Domingues; Olive tree; Marques, 2018).

This research aims to analyze the consensus and disagreements of the social representations of the quality of life of people living with HIV in medium and large municipalities.

METHODS

This is a descriptive study with a qualitative approach, based on the Theory of Social Representations (SRT), using the procedural approach to analyze the consensus and dissent of the social representations of the quality of life of people living with HIV.

The study was carried out in outpatient HIV/AIDS care units in the cities of Rio de Janeiro, Macaé and Rio das Ostras. The total number of participants was 68 subjects, and 34 participants from the city of Rio de Janeiro (large); 17 participants from Macaé and 17 from Rio das Ostras, totaling 34 interviews in medium-sized municipalities.

The study participants are people living with HIV assisted at the HIV/AIDS outpatient clinics chosen for this study. The inclusion criteria were: being at the time of data collection waiting for the consultation or exams; be 18 years of age or older; and be in mental and autonomous conditions that would allow participation in the study. A non-probabilistic, convenience sample was adopted, chosen from information provided by the health units on the number of clients under follow-up, composing the study universe. The norms established by Resolution No. 466/12 of the National Health Council, which provides for the guidelines and norms that regulate research involving human beings, were

observed, and was approved by the Research Ethics Committee of the three municipalities studied. The participants read and signed the Informed Consent Form (ICF).

For data collection, a questionnaire to characterize the participants and a semi-structured interview script were used. The data were analyzed with the aid of *SPSS and Iramuteq* software.

The comparative analysis was developed with the Descending Hierarchical Classification (DHC) technique, applied to the two corpora, one composed of interviews from the large municipality and the other from the medium-sized municipality. These corpora were submitted to analysis separately, resulting in two sets of classes that express the representational contents of the quality of life of each subgroup of municipalities analyzed.

For the qualitative analysis of the groups, a comparative procedure of the results of the DHC was developed**.** With this procedure, it was possible to capture the different specificities of each social group studied, segmented by the size of the municipalities – medium and large. The construction of the comparative procedure was based on the premises proposed by Doise (1972) regarding the need and interest in studying representational dynamics exactly where they are produced, that is, in the context of social relations, which are justified and anticipated by the former.

The stages of this comparative analysis were as follows: 1) The corpora of medium and large municipalities were submitted to lexical analysis separately; 2) a detailed reading of each class was carried out, seeking to understand the semantic contents together; 3) the classes were observed according to the variables associated with each class, by the highest value of x2; 4) the classes were observed with the reduced forms with higher association values; 5) the classes were observed according to the text segments (TS's); 6) the axes of the divisions of the CHD were named, according to their context; 7) naming of classes, according to their context and the axes from which they resulted; 8) the description of the classes was carried out; 9) for the comparative analysis, the vocabularies, semantic contents and variables with the greatest association with each class were taken; 10) construction of a first spatial view of the main similarities and differences of the two analyses; 11) comparison through vocabulary indicators, TS's and variables, to recognize the main similarities of the contents of the classes in the two groups; 12) comparison through vocabulary indicators, TS's and variables, to recognize the main differences in the contents of the classes in the two groups.

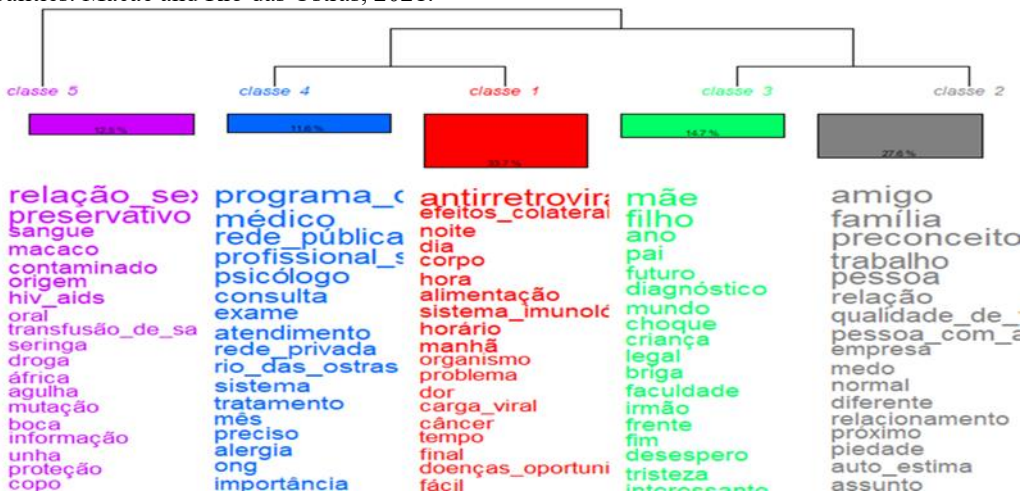
After the development of the stages described, it was possible to identify the differences and similarities between the subjects of the medium and large municipalities of the State of Rio de Janeiro.

RESULTS

The sociodemographic and clinical characterization of the participants reveals that the majority of the group is composed of women, aged between 18 and 38 years (medium size) and 39 to 59 years old (large size); high school education level (9 years of schooling) (medium size) and higher education (large size); in a situation of job stability; monthly personal income of up to R$ 1,000.00 (medium size) and from R$ 2,001.00 (large size); they are divided between not having a religious orientation and professing the evangelical religion; he has a partner; according to sexual orientation and mode of HIV transmission, homosexual (large size) and heterosexual or did not want to answer (medium size); they never use condoms; with a diagnosis time of less than 6 years; use ART and duration of ART use less than 4 years; they do not consider themselves sick; have a good perception of their own health.

The results of the lexical analysis of the interviews in medium-sized municipalities revealed 5,357 forms, with 75,445 occurrences; 3,089 reduced forms, with 2,090 active forms of words and 848 supplementary forms. The formation of the dendrogram of the DHC of these municipalities involved 2,126 TSs, with a use of 89.84% of the total TSs, generating five classes, as shown in figure 1.

Figure 1: Descending Hierarchical Classification Dendrogram by semantic content of the lexical analysis of medium-sized municipalities. Macaé and Rio das Ostras, 2021.



Source: Iramuteq software, 2021.

In order to better understand the internal divisions of the material during the CHD, it was chosen to be called "Social representations of quality of life for people living with HIV and their interfaces", followed by axis 1, entitled "Memories and knowledge of HIV transmission"; in the next division of the corpus, axis 2 was generated, "Relations, social determinants and public policies in improving the quality of life of people living with HIV". This was subdivided into two parts: "Policies of care for people living with HIV and their repercussion on quality of life" and "Affective and social aspects for quality of life".

The classes were named according to the division of CHD observed: Class 5: Sexuality, prevention practices and memories of HIV/AIDS; Class 4: Quality of life and its interface with health services; Class 1: Antiretrovirals and their interface with daily life and quality of life; Class 3: Interpersonal and family relationships and their interfaces with quality of life and Class 2: Prejudice, social support and their facets with HIV.

Figure 2 presents the results of the lexical analysis of the large municipality, which identified 3,639 TSs, that is, 80.08% of the total material analyzed, generating four classes. The corpus was composed of 7,091 forms and 125,712 occurrences; word stemming obtained 4,337, containing 4,128 active forms of words and 8 supplementary forms.

Based on the internal divisions proposed in the analysis, it was called "Social representations of quality of life for people living with HIV and their interfaces", followed by axis 1, "Constituent factors for quality of life"; this was subdivided into "Quality of life: from the present to the future in living with the syndrome" and "The affective and social dimensions of quality of life for people living with HIV". Axis 2 was called "Public policies and the support of the multiprofessional team in the process of living with HIV".

The classes were named as follows: Class 4: Predictors of quality of life; Class 3: Interpersonal and family relationships and their interfaces with quality of life; Class 2: Prejudice, social support and its facets with HIV and Class 1: Quality of life and its interface with health services.

Figure 2: Dendrogram of descending hierarchical classification by semantic content of the lexical analysis of the large municipality. Rio de Janeiro, 2021.



Source: Iramuteq software, 2021.

The results of the two analyses show consensual content and divergent content. The comparison of the classes shows that the consensual elements of the two analyses (medium and large) were related to the health services and the multiprofessional team; to the social and family relationships in the routine of people living with HIV. While the class: Prejudice, social support and its facets with HIV was shared by medium and large municipalities.

The analysis of divergent contents was carried out considering the specificity of each subgroup of municipalities. It is observed that sexuality, prevention practices and memories of HIV/AIDS and antiretrovirals and their interface with daily life are specific to medium-sized municipalities, while the predictors of quality of life only appear in large municipalities.

CONSENSUS ON SOCIAL REPRESENTATIONS OF QUALITY OF LIFE IN MEDIUM AND LARGE MUNICIPALITIES

The classes identified as consensual to large and medium-sized municipalities are: Classes 4/1 – Quality of life and its interface with health services; Classes 3/3 – Interpersonal and family relationships and their interfaces with quality of life and Classes 2/2 – Prejudice, social support and their facets with HIV.

Quality of life and its interface with health services (Classes 4 and 1)

Class 4 of medium-sized municipalities and class 1 of large municipalities were called "Quality of life and its interface with health services", due to the similarities presented and which will be described and discussed below. The classes were composed of 221 TSs (class 4), representing 11.57% of the total *corpus* analyzed, and 790 TSs (class 1), which comprises 27.11%.

The similarities of the variables associated with the two classes are: employment, religion, considering oneself sick, and personal income. It is observed that the similar variable was considering oneself sick with x2 = 6.41 and x2 = 21.97, in both sets of municipalities. With regard to the variables with different responses, the Catholic religion (x2 = 8.12) associated with medium-sized municipalities stands out, and not having a religion (x2 = 14.2) in the large one. Another variable with different answers is unemployed (x2 = 20.97), which is associated in large municipalities, and employed/working (x2 = 8.2), associated with medium-sized municipalities; in addition to personal income of R$ 1,000.00 (x2 = 18.22) associated with the large municipality and more than R$ 2,000.00 (x2 = 3.79) with the medium-sized municipality, marking the socioeconomic differences between the municipalities.

The two classes discussed deal with the institutional health support network for people living with HIV in the municipalities. The context of the health professionals' work, especially the figure of the physician and the psychologist, appears prominently in the discourse of these groups. These classes ratify the importance of care and treatment in the public health network, as a predictor of better quality of life, as can be evidenced in the following WH's.

> What helps the most in my quality of life today is because I have a doctor who takes care of my health, I have the STD/AIDS Program that is accompanying people with AIDS, and it is free. (interview 1095; municipality of Macaé; female; age 18-38 years; high school; employed; does not use ARV; does not consider himself ill).

Another relevant aspect to be highlighted concerns the interpersonal relationship established between users and health professionals. The care provided is evaluated as satisfactory, since the professionals, especially doctors and psychologists, develop active listening, establish dialogue and show affection and affection.

The care offered by the public health network was positively evaluated, with helpful professionals who safely guide patients in relation to their diagnosis and treatment, as well as the availability of free antiretroviral therapy. This positive evaluation is maintained, even among patients who reported having contact with other health services in the private network. As a negative aspect, failure in the organization of the program was reported, especially in the large municipality, but the positive evaluation is dominant in the discourses.

Interpersonal and family relationships and their interfaces with quality of life (Classes 3)

Classes 3 of the two analyses were called "Interpersonal and family relationships and their interfaces with quality of life". They are composed, respectively, of 280 STs (14.66%) in medium-sized municipalities and 386 STs (13.25%) in large municipalities.

Regarding the confluences of the associations of variables with classes, females stand out, with a higher x2 = 32.93 in a large municipality and a smaller one in a medium-sized municipality (x2 = 6.63). The variables related to the time of diagnosis and time of use of ARV have different responses in the groups. In medium-sized municipalities, the time of diagnosis is up to six years (x2 = 18.34); use of ARV for up to four years (x2 = 18.6). For the large municipality, the time of diagnosis is greater than 14 years (x2 = 8.87); use ARV for more than 11 years (x2 = 7.5). This opposite configuration of the time of diagnosis and the time of use of ARV is important because it expresses the subjects' greater experience in dealing with the disease in the large municipality and expresses the process of interiorization, which followed the appearance of the first cases in large cities. These attributes have potential repercussions for the daily lives of these groups, as well as for the way they represent quality of life.

It is important to emphasize in these classes how the affective and social aspects are verbalized in each group. These relationships, especially family relationships, are similar in terms of the bond established, the relationship between father, son, brother, which incorporate the socio-affective dimensions. Therefore, these classes present elements of day-to-day living, of conviviality and that encompass various feelings, such as suffering and fear of the revelation of the diagnosis, prejudice, death, loneliness, religiosity and hope for the future.

Quality of life is not only related to a long life, since living with HIV is facing several difficult situations in daily life, including discrimination, segregation, the rupture of affective and family relationships and difficulties in the exercise of sexuality, as shown in the WS below.

> Currently my social support is my mother; My mother supports me a lot, she always picks on me, my family. (interview 0075; municipality Rio de Janeiro; male; age 18-38 years; high school; employee; uses ARV; does not consider himself ill).

It is important to highlight, in the discourses of the interviewees from the large municipality, religiosity as a pillar for coping with HIV and the obstacles arising from this serological condition. Spirituality provides a different way of seeing the disease, through belief in God and faith, helping in the acceptance of the diagnosis and in the experiences related to the infection.

> In the past I had faith, I had faith that I was going to be healed, I had this promise from God that I was going to get married, that I was going to have children, so some part of me had this tranquility. (interview 0162; municipality Rio de Janeiro; female; age 39-59 years; higher education; employee; uses ARV; does not consider himself ill).

In view of this, in the family context and in social life, HIV/AIDS is represented as a disease that brings suffering, fear of discovery and prejudice. Quality of life, in turn, is represented by the support of family and friends, in the group to which they belong, and through religiosity, which presents itself as a relational facet with the divine.

Prejudice and social support as facets of quality of life (Classes 2)

Classes 2 of the medium-sized municipalities and the large municipality were called "Prejudice and social support as facets of quality of life". The classes were composed of 527 TSs (medium size), representing 27.59% of the total *corpus* analyzed, and 790 TSs (large size), which comprises 27.11% of the material analyzed.

In the associations of variables to classes, heterosexual orientation associated with medium-sized municipalities and homosexual/bisexual in large municipalities stand out. The highest personal income is common to both classes, with $x^2 = 9.33$ in the medium-sized municipality, while in the large-sized municipality x2 = 4.47; as well as the variable time of ARV use more than 11 years (x2 = 4.99 and 2.88, respectively in large and medium-sized municipalities; and non-use of condoms with x2 = 2.81 and 2.33 in medium and large municipalities.

One of the aspects addressed in the evaluation of the quality of life of people living with HIV encompasses social support, mainly due to the situations of prejudice that still characterize reactions to seropositivity and that can affect the support network. The fear of prejudice and isolation as self-protection sometimes make individuals hide the diagnosis or cut the bond with family members, generating even more suffering, isolation due to the reduction of the support network.

> I think there are people who just say that you are a person with AIDS or that you know a person with AIDS already move away. That's prejudice, that's how people are. Currently my relationship with my family is good. (interview 1073; municipality of Macaé; female gender;

> age 39-59 years; elementary school; employee; does not use ARV; does not consider himself sick).

The manifestations of prejudice in the world of work can cause suffering to this group in its sociability dimension, as they seek to keep their HIV seropositivity secret due to the fear of exclusion from work and the judgment of colleagues, avoiding questioning this aspect.

> About the quality of life at work, the situation currently is if you tell people that you are a person with AIDS, prejudice appears; people don't know what this situation is, what it's like to live with HIV/AIDS. (interview 0120; male; age 18-38 years; higher education; employee; uses ARV; does not consider himself ill).

The two classes reveal the strategies for coping with prejudice, observed in both medium and large municipalities. These strategies are differential and adaptive in the face of positive or negative attitudes of the support network when confronting the disease. But they are also permeated by the memories of HIV/AIDS that bring the fear and prejudice experienced in the past to the current reality.

DISAGREEMENTS IN THE SOCIAL REPRESENTATIONS OF QUALITY OF LIFE IN MEDIUM AND LARGE MUNICIPALITIES

The classes identified as specific to each group of municipalities analyzed configure the disagreements in the social representations of quality of life and will be presented. The classes that make up the dendrogram of medium-sized municipalities are: Class 5 – Sexuality, prevention practices and memories of HIV/AIDS; Class 1 – Antiretrovirals and their interface with daily life and quality of life. The large municipality has only one specific class: Class 4 - Predictors of quality of life.

DISAGREEMENTS OBSERVED IN THE SOCIAL REPRESENTATIONS OF QUALITY OF LIFE IN MEDIUM-SIZED MUNICIPALITIES

Sexuality, prevention practices and memories of HIV/AIDS (Class 5)

Class 5 of the analysis of medium-sized municipalities called "Sexuality, prevention practices and memories of HIV/AIDS" is composed of 239 WH, which comprises 12.51% of the total corpus analyzed. The variables with the greatest association with the class are: non-use of ARV (x2 = 19.88); evangelical religion (x^2 = 11.03); time of HIV diagnosis of up to 6 years (x2 = 6.94); marital status without a partner (x^2 = 3.84); and personal income of up to R$ 1,000.00 (x2 = 3.14).

Participants from medium-sized municipalities reveal that they are aware of the form of sexual transmission of HIV and describe having contracted the virus from sexual partners due to the non-use of prevention methods. Lack of information does not seem to be the main factor associated

with contagion, although it still exists, and is responsible for triggering the increase in risk behaviors, such as the practice of unprotected sex.

> HIV/AIDS is easy to transmit through sexual intercourse without a condom, oral intercourse as well. I believe that it is caught through the secretion of sexual intercourse without a condom; using drugs with a needle that other people use at the same time. (interview 1089; municipality of Macaé; male; age 18-38 years; high school; retired; uses ARV; does not consider sick).

This class demonstrates contents related to the importance of knowledge for the adoption of prevention practices, but also to the non-linearity between having knowledge and adopting such practices. Sexual transmission was the most reported form of transmission, with implications for the exercise of sexuality. Quality of life, therefore, is understood as dependent on the degree of freedom and responsibility in the exercise of sexuality.

Antiretrovirals and their interface with daily life and quality of life (Class 1)

Class 1 of medium-sized municipalities, named "Antiretrovirals and their interface with daily life and quality of life", has 643 TSs, which comprises 33.66% of the total corpus analyzed, being the largest class of medium-sized municipalities. The variables with the greatest association with the class were: considering oneself sick ($x^2 = 32.05$); evaluation of good or very good health ($x^2 = 26.82$); always use a condom ($x^2 = 23.95$); homosexuals + bisexuals (x2 = 22.07); transmission of the disease through MSM/homosexual contact ($x^2 = 19.45$); time of HIV diagnosis of 6-14 years ($x^2 = 14.37$); uses ARV (x2 = 10.29).

In order to achieve the longevity predicted by the appropriate use of ART, adherence to treatment must remain adequate over the years. In the testimonies, the participants reveal feelings related to the use of antiretrovirals and the practices of a healthy eating routine and physical activity in order to preserve their quality of life.

The relationship established with ARV is marked by ambiguous feelings, as the medication is something that promotes control and living with HIV, without AIDS. At the same time, something that causes damage associated with difficulties in adhering to ART due to the side effects caused, the amount of medications and schedules, sometimes segregating these patients and placing the disease as a secretion, negatively influencing quality of life.

> Currently, I honestly only have the benefits, because I don't have any side effects. The only thing is that I only remember later that I have to take that antiretroviral at night; I take it once a night just before bed. (interview 0162; female; age 39-59 years; higher education; employed; uses ARV; not considered ill).

> For those who did not take any antiretroviral, starting to take almost 20 pills a day of antiretroviral messes with the psychological. I had to always be worried about whether it's time to take antiretrovirals; you have side effects. (interview 1069; municipality of Macaé; female gender; age 18-38 years; high school; employed; uses ARV; does not consider sick).

The subjects refer to the concern with the adoption of healthier habits developed through attitudes and behaviors recommended by science, related to food, sleep, physical activities, in addition to the appropriate use of antiretroviral drugs.

This class was associated not only with the use of ART, but with treatment in a broader conception, involving several dimensions that contribute to a good quality of life, even in a situation where the infection exists. The most positive associations related to the use of ART were characterized by the understanding of the need to readapt to the adoption of new daily habits, with the insertion of the continuous use of medications, in addition to the maintenance of other healthy behaviors. In addition, the greatest difficulties reported by the participants were linked to pharmacological side effects and the maintenance of a routine use of medications.

DISAGREEMENTS IN THE SOCIAL REPRESENTATIONS OF THE QUALITY OF LIFE IN THE LARGE MUNICIPALITY

Predictors of quality of life (Class 4)

Class 4, resulting from the analysis of the large municipality, called "Predictors of the quality of life of people living with HIV", is composed of 926 TSs and 31.78% of the total corpus analyzed, making up the largest class in this municipality. The variables with the greatest association with class are: good/very good health assessment (x2 = 14.82); male sex ($x^2 = 12.92$); not using ARV ($x^2 = 9.72$); age group from 18 to 38 years ($x^2 = 8.39$); not having a partner ($x^2 = 7.39$); and personal income from R$ 2,001.00 ($x^2 = 6.96$).

The predictors of quality of life identified in this analysis are related to healthy lifestyle habits, such as healthy eating, physical activity, regulated living, in addition to leisure, work and the maintenance of a belief in the divine.

The possibility of conceiving positive expectations and enjoying good health translates into better acceptance of the condition of seropositivity and greater adaptation, which ends up reflecting on the quality of life. By analyzing the class in question, there is a tendency already evidenced by other studies to present the representational aspects of AIDS linked more to life and future perspectives, surpassing, at least partially, the presence of representation in death.

> The most important factor for the quality of life of people with AIDS today is prevention, maintaining a healthy life, doing physical activity. (interview 0164; municipality Rio de Janeiro; male; age 18-38 years; high school; employee; does not use ARV; does not consider sick).

Quality of life is also expressed by good nutrition, physical activity and work, aspects pointed out as part of a functional dimension of the social representations of the quality of life of people

living with HIV. It is noteworthy that good nutrition was also associated with self-care mode, such as that which replaces unhealthy habits, even in patients who are not using ARV.

Another important aspect for people living with HIV is work, since it is what ensures subsistence, in addition to being an environment of social interaction and one of the ways used to categorize individuals in society as productive or unproductive.

> What is most important in quality of life today is that you have a good diet, that you can move on with your life, take your life into the future. (interview 0090; municipality Rio de Janeiro; male; age 39-59 years; higher education; employee; uses ARV; does not consider sick).

People living with HIV seek strength to accept their condition and take spiritual care of themselves, providing feelings of faith, hope and peace, being a predictor of good quality of life.

> Hold on to some religion, at least something to believe the future will be better. I understand quality of life as physical activity, food and leisure. I think these are fundamental things today for you to have a quality of life. (interview 0011; municipality Rio de Janeiro; male; age 18-38 years; higher education; employee; does not use ARV; does not consider sick).

This class refers to the quality of life represented by multidimensional attributes of the daily life of people living with HIV, mainly related to objective indicators expressed in health-protective lifestyle habits.

DISCUSSION

In the context of HIV/AIDS, the concern with the concept of QoL refers to a movement within the human and biological sciences towards valuing parameters that are broader than just symptom control, mortality reduction or increased life expectancy, in which understanding QoL and its expression in symbolic constructions is fundamental. Thus, understanding the relationship between living with HIV and QoL implies apprehending the way they are structured and define their social practices and behaviors (Antunes et al., 2022).

The implications of living with HIV go beyond physical and biological impairment. Psychological and social difficulties are also observed, which are factors that influence living with this condition. The stigma and prejudice experienced, or even the fear of experiencing them, can lead to social and family isolation, compromising the social support network and health monitoring (Marques et al., 2020).

Also from this perspective, social relationships may also be threatened due to the fear of suffering discrimination and prejudice, for example, at the time of disclosure of the diagnosis. Thus, the individual chooses not to reveal his or her HIV-positive serology, adopting behaviors of social isolation and withdrawal (Oliveira et al., 2023).

This fact is presented in an integrative review of social representations of people living with HIV in which it portrays stigmas and prejudices, social dimensions, social vulnerability and health conditions (Juliano; Andrade; Thobald, 2022).

Another study demonstrated the diagnostic representations of 14 HIV-positive patients in the city of Rio de Janeiro. The representations were divided into two groups: pessimistic representations whose content refers to stigmatized diagnosis, AIDS appearance, contaminating potential, diagnosis of imminent death, diagnosis as a punishment; and optimistic representations in which participants refer to their quality of life as appearing healthy and dissociation between being the carrier of the virus and having AIDS (Muniz; Brito, 2022).

Thus, the social representations of the quality of life of people living with HIV are important due to the need for subjects and groups to keep themselves informed about their health, the process of becoming ill with HIV and the strategies to cope with this process, ensuring a better overall quality of life for the group. An integrative review study reveals that understanding HIV from the perspective of social representations favors reflections on the disease and its repercussions on daily life. Anchoring through this process allows the understanding of the perceptions and singularities experienced by people living with HIV/AIDS and contributes to a change in behavior and the reduction of the harmful effects of the disease (Fonseca et al., 2023).

Anchoring can involve the modulation of behaviors, making the environment and certain social objects more familiar and, therefore, subject to greater physical and intellectual domination, with the identification and resolution of emerging issues in the daily life with HIV and AIDS. In this process, it becomes essential for this group to attempt to integrate new, unfamiliar elements, originating from reified knowledge, into a system of pre-existing norms, beliefs, and values and, therefore, less alien to it, as proposed by several basic authors of SRT (Oliveira et al., 2023).

Thus, quality of life is conceptualized in the reified universe from different approaches, it is a complex concept that admits a diversity of meanings, with varied theoretical approaches and numerous measurement methods. The impact of HIV infection can generate changes in several aspects of individuals' lives. Facing this problem, associated with the difficulties that serological status imposes in relation to quality of life, has been one of the challenges faced by people living with HIV and by science (Cecílio et al., 2018).

The social representation of the quality of life observed from the set of subjects studied is constituted by symbolic dimensions related to the following contents: HIV/AIDS control program; antiretroviral drugs; interpersonal, affective and family relationships; sexual and prevention practices; social aspects and prejudice; in addition to a pragmatic dimension related to health promotion practices and the future.

The search for good levels of quality of life and not getting sick involves behaviors that aim to change lifestyle in terms of physical health, psychological state, level of independence, social relationships, and interaction with the environment (Silva et al., 2021). In the results of this research, these dimensions were observed as essential for the promotion and maintenance of quality of life. These contents were built from psychosocial and communication processes developed throughout the AIDS epidemic in Brazil and in the world. These dimensions express consensual representational contents, therefore, shared quality of life by the groups studied.

The consensual contents mentioned showed variations in the comparison between the groups, revealing that some of them are specific to a certain group of people living in large or medium-sized municipalities. These specific contents are: antiretroviral drugs; sexual and prevention practices; pragmatic dimension related to health promotion practices and the future, and family and interpersonal relationships. The understanding of the disagreements made it possible to highlight symbolic constructions specific to each set of municipalities studied.

The differences observed suggest symbolic variations due to the socio-economic-cultural and historical contexts of each city. The quality of life in medium-sized municipalities was observed based on dimensions exclusive to this group, which are not shared with the subjects of the large municipality. They are those related to: use of antiretroviral drugs, maintenance of sexual practices and prevention.

These representational contents allow us to reinforce the importance of these themes for quality of life, permeating concepts and concerns related to the body, illness and its coping, as well as behavioral aspects related to daily practices in the face of the disease. For the large municipalities, they were surrounded by contents specific to the quality of life, revealing a specific dimension, related to the adoption of a healthy lifestyle, with food, physical exercise and the adoption of a positive vision of the future, approaching the concept proposed by the World Health Organization.

CONCLUSION

It is concluded that differences were observed in the contents of the social representations of quality of life in the two groups analyzed, referring to cultural and socio-historical constructions typical of the ways of life and interpersonal relationships of small and large cities. This finding points to the adoption of lifestyles focused on self-care in order to achieve a better quality of life in large municipalities and to cope with the disease and the maintenance of more conservative values with regard to ways of living in medium-sized municipalities.

However, the presence of two distinct representations cannot be affirmed, considering the existence of hegemonic consensual elements in both groups, in addition to the need for other confirmatory techniques of analysis. In this context, the importance of public policies to value the

subjective issues expressed by individual subjects and social groups should be considered, since the understanding of quality of life is not reduced to the biomedical model and is related to the social, cultural and ideological context, if the intention is to produce a positive impact on the lives of people living with HIV.

It is believed that the data presented here and other studies can favor a reflection of health professionals, and especially nursing professionals, regarding their role in the performance of health care, in favor of a more effective nursing care in which the role of each professional is known and recognized.

STUDY LIMITATIONS

The convenience sample that limits the demonstrative effect of the results stands out; technical difficulties still present in some functionalities of the Iramuteq software that prevented even more objective comparisons.

CONTRIBUTIONS TO THE AREA OF NURSING, HEALTH OR PUBLIC POLICY

It is believed that this article can contribute to understanding how health professionals can interfere in the health care established today and provide reflections that enable professional improvement, to improve care and, therefore, the quality of life of people living with HIV.

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Digital learning ecology for global citizenship education

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Ana Vanessa Leguízamo León[1]

ABSTRACT

In the context of globalization and the interest of many higher education institutions in carrying out internationalization activities, this work presents the development and results of an educational experience for global citizenship in which the concept of digital ecology of learning was used for its description. The case study focuses on a postgraduate course in education from a university in Brazil, taught through face-to-face and virtual sessions. The distance sessions were developed using synchronous videoconferences with guest professors from nine Ibero-American countries. The objective of these sessions was to learn about the progress of educational technologies in each of their countries, based on the concepts of global citizenship during the development of the classes. The experience made it clear that, although the contents and the learning environment were the same, each student developed their own themes supported by the proposed digital learning ecology, according to their particular interests and context.

Keywords: Educational technology, Global citizenship, Learning ecology, Teaching methods.

[1] Highest degree: Doctor of Education.
Academic institution: Federal University of Santa Maria, Central University of Venezuela.

INTRODUCTION

Today we see that it is possible to carry out transactions with total freedom and it is extremely difficult to detect its origin. On the other hand, people fleeing their countries are being detained at the borders. It is possible to talk about economic, cultural and political dependence between countries, but at the same time, we see the increase in refugees and inequality.

In this work, the starting point is that, in the educational context, spaces should be created that allow reflection on contemporary problems or conflicts common to humanity and that make it necessary to learn other types of skills. These spaces can also serve to establish collaboration between peers, from which it is possible to study the particular situations of each country, through interaction between people of different nationalities, but with similar interests (Morosini, 2019). For these experiences to be meaningful and natural, it is necessary to train citizens who are increasingly technologically fluent, that is, with the ability to critically understand problems and share innovative solutions (Guilherme and Cheron, 2019).

In the educational context, technological fluency goes beyond the instrumental and operational domain, it must be based on epistemological, ontological, psychological, historical, and philosophical models and conceptions of pedagogy. These elements are essential for understanding the nature, political, cultural, social, and economic principles of the digital universe, as well as their impacts. This perspective is based on the inseparability between humans and non-humans, as articulated in the tripod science, technology and society widely defended by Latour (1994; 1999; 2000; 2001). In this scenario, it is increasingly important to be prepared to act as global citizens, considering the great impact, potential, and challenges that contemporary technologies impose.

A global citizen is a citizen of the world, who identifies with and actively participates in local and global issues, values the differences between people of different nationalities and languages, as well as works with them to find solutions to problems that transcend borders. According to UNESCO (2023), global citizens do not have a special passport or official title, nor do they need to travel to other countries or speak different languages. Rather, it is about the mindset and actual actions a person takes on a daily basis, but there is no single concept to define a global citizen. It is said that a global citizen must have certain characteristics, such as awareness, responsibility, intercultural participation and empathy, personal fulfillment, and international mobility (Schattle, 2008). And to this, we add the need to build fluency around contemporary technologies, especially in the universe of content, interactivity and digital interactions.

Thus, global digital citizenship presents as an inherent challenge the development of the conditions for critical analysis of contents, sources, interests, influences, development conditions that allow technical and technological inventiveness, the constant restructuring of work models and the role of workers in each context, investment in science and data sovereignty based on the principles of

the ethics of the common good. According to Kraska, Bourn and Blum (2018), global citizenship is demonstrated by the awareness that the person has of himself, of the world and of his position within it. This, in turn, generates a sense of responsibility towards the world as a whole and results in individual and collective calls to action.

In this sense, the internationalization of education has become a fundamental element in the preparation of students for this globalized society, seeking to improve the quality of education, encourage research and promote intercultural understanding. It also contributes to the formation of global citizens, capable of facing current challenges and working together to build a fairer and more sustainable world. The contents, interactions, and dynamics of life in an increasingly digital society demand global efforts that intend to organize, delimit, and direct sustainability, since the wide range of socio-technical creations has been made possible from the perspective of the profitability of production and consumption models. In the digital world, one of the most obvious opportunities for the internationalization of higher education is the possibility for students to get to know first-hand different cultures, languages, and ways of life. (Baranzeli, 2019). This allows them to learn from each other and develop intercultural skills that will be valuable to their professional and personal lives. Internationalization also provides the opportunity to enhance students' language skills, as they are exposed to different languages and have the chance to practice them in real-life situations.

This article presents a learning experience developed within the scope of a discipline offered in a postgraduate course in Education at a federal university in Brazil, during semester 1-2023. The discussion spaces were planned over a semester with the participation of teachers from different Latin American countries, with the intention of discussing policies, projects, innovations, resources and pedagogical practices related to educational technologies in each of their countries. Specifically, nine professors from Brazil, Bolivia, Chile, Colombia, Ecuador, Spain, Mexico, Uruguay and Venezuela were invited. Each of the sessions featured an Ibero-American guest who shared, with the group, information about educational technologies in his country, as well as his experiences, productions and private reflections on the subject. The sessions were held in two languages: Spanish and Portuguese.

To present the experience, the concept of learning ecology is incorporated, with the intention of describing the particular characteristics of each student, the connections with their classmates and with the guest teachers, who, in turn, have other characteristics: they speak another language, work with other educational policies, with other technological resources, among other situations that arose during the course.

In this sense, the objective of this work is to present a digital learning ecology for education in global citizenship, used in the development of a teaching-learning experience within the scope of a postgraduate course in education. The results of this experience are still being produced, as the bonds

between teachers and students have been established and continue to be maintained. It is also worth mentioning that both students and teachers, regents and guests, were able to share experiences, misunderstandings, establish similarities between different contexts and associate them with the strong cultural relationship that unites these countries. This international dialogue is strengthening the study of different epistemological conceptions of technology related to politics, science and society.

EDUCATION FOR THE GLOBAL CITIZEN

The term global citizen has begun to be part of the political vocabulary of higher education institutions around the world. The relationship between globalization, internationalization, and higher education has been an important topic of academic debate over the past decade. In response to the economic and social pressures of globalization, universities are now engaged in a wide range of activities aimed at internationalizing their institutions, including the recruitment of foreign students and faculty, the internationalization of curricula, and the promotion of international research collaborations. The concept of global citizenship emerged along with these debates on internationalization and is proposed as a way to prepare people to deal with the rapid changes and uncertainty that characterize globalization. In this sense, the concept of global citizenship education aims, among other things, to go beyond citizenship education, as it may not be sufficient to describe today's citizens, who are informed and relocated, who exercise rights beyond a nation-state, and who can engage with events elsewhere and with citizens of other countries (Davies, 2016).

A separate category deserves the global educator, who, according to the same author, are classroom teachers, school principals and students with international credentials, contacts and research agendas; leaders of international exchange programs, coordinators of international working groups. Together, they form a visible and dynamic group of global citizens. Global educators prepare their students to function in an international context while instilling awareness and empathy for other countries, cultures, and other issues of common concern around the world. A global educator does not necessarily seek recognition as a global citizen, but wants their students to achieve that description.

Historians of education explain how the concept of mass education was created with the aim of educating citizens for the nation-state. The schools were created with the intention of imparting a set of values and knowledge that would lead to social cohesion and a sense of national belonging. A simple search on the Internet shows that citizenship education is now not only national, but also global. Global citizenship education is becoming part of international policies (UNESCO, 2023) and is being included in some national curricula, for example in Ecuador, Korea and Scotland (Davies et al, 2018). It is likely to be one of the educational priorities in the twenty-first century. The concept of

citizenship education can be complex, as it is unlikely that we will find a definition that encompasses all aspects of the groups and individualities involved. Known as Global Citizenship Education (GCE), it contains different underlying ideologies about the meaning of citizenship, globalization, and the role of education in a global society. According to Franch (2020), GCE can be understood in relation to the three main objectives of education: socialization, qualification, and subjectivation.

Educational institutions play a key role in the socialization of students. They transmit values, cultural norms and knowledge that contribute to students understanding their role in society. In the context of the GCE, socialization goes beyond national borders. It involves cultivating a sense of global responsibility and interconnectedness. Through socialization, students learn about global challenges, diversity, and interdependence.

Regarding qualification, GCE aims to equip individuals with the knowledge, skills and competencies to deal with the complexities of an interconnected world. It fosters a global mindset by encouraging students to recognize their role as active national citizens with an informed global conscience. In essence, it prepares them to participate effectively in a globalized system.

The dimension of subjectivation emphasizes critical thinking, autonomy and political awareness. Subjectivation encourages students to question dominant discourses, challenge inequalities, and engage in social justice. It goes beyond mere qualification and socialization, requiring educators to promote a political perspective based on global citizenship. By critically deconstructing existing orders, students become more autonomous and independent in their thoughts and actions.

In summary, GCE provides educators with tools to help young people understand the contemporary world. It encourages conscious decision-making about their role as global citizens, emphasizing both the skills and qualities essential for responsible global engagement.

DESCRIPTION OF THE LEARNING EXPERIENCE

The experience was developed in a course offered in the Graduate Program in Education at the Federal University of Santa Maria (UFSM), in Brazil, during semester 1-2023. Discussion spaces were planned throughout the semester with the participation of teachers from different Latin American countries, with the intention of discussing the use of educational technologies in each of their countries. Specifically, nine teachers from Brazil, Bolivia, Chile, Colombia, Ecuador, Spain, Mexico, Uruguay and Venezuela participated. Each of the sessions featured a guest speaker who shared with the group information about the use of educational technologies in their country, as well as their particular experiences in this area. The sessions were held in two languages: Spanish and Portuguese.

Within the scope of the internationalization movement of Brazilian universities, UFSM has incorporated among its policies the hiring of visiting professors, this being the case of one of the professors of the discipline, who currently works as a foreign visiting professor in the Graduate Program in Education. These hires are made with the objective of allowing the integration of foreign researchers in research and teaching activities linked to graduate studies, in order to strengthen and qualify the programs and enable scientific and technological exchange, in this case mainly between the professor's home university, the Central University of Venezuela and UFSM and between these and other higher education institutions.

The course content was structured in two thematic units: the first with the objective of studying aspects related to educational technologies, their evolution, types and successful scenarios of use. The second unit was oriented towards the study of educational technologies in Latin American countries, with special emphasis on educational policies related to technologies in the countries studied. In the first unit, the contents were discussed and studied between teachers and students in five face-to-face sessions with an average duration of four hours. The second unit was developed with nine distance sessions with an average duration of two hours, each with the participation of a guest professor. During these distance sessions, the guest professor presented the theme of educational technologies in his country, aiming to expose the current situation and his particular experience teaching in this area. At the end of the guest teacher's explanation, a space for interaction was opened that often led to memories of global events that marked advances in educational technologies, enriching the conversation and reconstructing experiences in each of the participants.

One of the important aspects of this experience is that each student in the course had their own workspace and concerns regarding the topic at hand: educational technologies, but each session shared the vision of a different country, with distinct political, economic, social and educational characteristics. Likewise, each guest professor also had his own context, that of his country, but he was also interested in knowing the context of Brazil, which is considered one of the references in Ibero-America. With this configuration, the concept of learning ecology is incorporated, which seeks to define particular learning contexts according to similar characteristics.

LEARNING ECOLOGY

Barron (2004, p. 6) defines learning ecology as the set of contexts found in physical or virtual spaces that offer learning opportunities. Each context is composed of a unique configuration of activities, material resources, relationships, and interactions that arise from them. From this point of view, the role of interactions, practices, social resources, and technologies is emphasized throughout individual learning trajectories mediated by digital tools (Barron, 2006).

According to González-Sanmamed, Muñoz-Carril, Santos-Caamaño (2019), the components of a learning ecology are grouped into two dimensions according to their characteristics, origin, and projection. The Intrinsic Dimension, which includes the aspects most related to the internal character that represent a disposition for learning: conceptions, motivations and expectations; and the Experiential Dimension, which includes other elements that are part of the person's learning path as a result of their successive lifelong learning processes: relationships, resources, actions, and context. Each of these elements is related to others and cannot be analyzed in isolation.

For this research, the components of learning ecology are defined as follows:

- Experiential Dimension

  Actions: refers to the specific events and experiences that mediated learning. During the first five Sessions, the basic concepts of educational technologies were discussed in face-to-face classes, allowing teachers and students of the course to share information, know the motivation of each student to participate in the course and what their expectations were. The following nine classes were held synchronously through videoconferencing platforms, with the participation of an international guest speaker in each class, who presented the situation of educational technologies in their country. After each presentation, there was a space for questions and interaction with the guest. The Moodle platform was also used for the exchange of experiences and the delivery of the assigned assignments.

  Resources: they are the mediators of the activities of the disciplines directed to the learning objective and are defined by their different ways of interacting with the context. In the experiment described here, guests were asked to provide digital materials or URLs of information about the topic of study in their country. This information was made available in Moodle with the link to the videoconference. A wiki was also made available for the elaboration of possible questions to the guests. Subsequently, the slides of each guest were published in the institutional Moodle.

  Interpersonal relationships: are linked to different learning activities to link resources; They are the fundamental basis for the construction of knowledge networks, one of the main strategies in learning ecologies. The relationships were between the course professors, the students and the guest speakers. In all cases, the guest teachers were receptive to communication with the students and provided their contact details.

  Context: according to González-Sanmamed, Muñoz-Carril, Santos-Caamaño (2019), the idea of context is fundamentally inductive because it is built from the presence and interaction of the central elements described and requires the existence of a learning objective that generates and gives meaning to its internal dynamics. In the case described,

the context was the central axis of the course. The context changed with each class, depending on the guest's country and the information he had to present, as well as the previous readings that each student had done. This is consistent with the same author's assertion that there is a third level of intercontextual relations that give full meaning to ecological theory, as often a real learning objective is not fully satisfied in a single context, but may appear distributed in multiple environments.

- Intrinsic dimension: González-Sanmamed, Muñoz-Carril, Santos-Caamaño (2019) states that the intrinsic dimension influences and is influenced by the components of the Experiential Dimension that articulate the individual's life trajectory. Individuals choose to engage in certain activities based on the opportunities in which they live. These choices are not only conditioned by external structures, but also by each individual's interpretation of the available contexts, resources, relationships, and actions. These ecological components intrinsic to the individual are fundamental axes in educational environments: conceptions, motivation and expectations about learning as relevant factors in the individual's decision to engage or not in learning activities and contexts.

In the case presented, the individuals are graduate students in education, master's and doctoral degrees, linked to research related to educational technologies. His conceptions, motivations and expectations revolved around knowing the state of the art of the topic in question, information that could be of interest in each of his researches. They were also interested in establishing contacts with foreign professors that could lead to co-orientations, internships, or evaluation tribunals.

In the final evaluation of the course, students were asked to relate their research topic to the presentations of the invited speakers, so that the students had to do a second review of the materials provided and, in some cases, of the recordings of the classes, with the intention of looking for links between concepts, contexts and situations presented by the guests and their particular research situations. This learning ecology has led to collaborations between students and teachers that are still developing.

DISCUSSION OF THE RESULTS

As indicated in the previous section, as the final work of the course, students developed an essay in which they were asked to link each of the contexts presented by the guests with their master's and doctoral research topics. This task led them to seek information related to their own research in each of the guests' countries of origin, conducting a learning process linked to the global context, analyzing the relevance of their topics in each country and, in turn, linking them to the Brazilian context. It was not the intention of the evaluation to establish comparisons between the

different countries, but to seek information on research similar to its own and to analyze the possible results of its proposals in each invited country.

In general, the students stated that they did not have extensive prior knowledge about educational technologies in each of the countries studied. Thus, relying on the information of the professors-researchers of each country allowed them to establish this proximity with each context, promoting the characteristics of awareness, responsibility, participation and intercultural empathy that global citizens should have. At the same time, it was possible to develop the purposes of socialization, qualification and subjectivation that were described above. Thus, some of the essays presented include, for example, one related to food policies and technologies to promote healthy eating habits in Brazil. This is the research theme of the student who developed this essay, which led to the consultation of the guests on this specific point and the search for information in relation to the particular context of each country, with relevant results in this regard. Another essay that can be mentioned is related to the role of technologies during the pandemic period, a theme that was presented by several of the guests and that is part of the research of one of the students. In this case, it was possible to learn about good and not so good experiences in each of the participating countries, which also led to an in-depth search for official reports and research articles that could be part of the state of the art of the work that was being carried out. These examples show that students have used learning ecology and applied it in their specific research contexts, taking advantage of the content taught but also situated in the contexts of each country studied, demonstrating empathy and global responsibility.

CONCLUSIONS

The experience described here allowed the organization of the information generated during a graduate course with the concept of digital learning ecology, as it was possible to perceive that each student used the information and content available differently. From this, it generated a new network of information that directed its research to contexts outside its borders, that is, global, including policies, proposals, projects and innovative solutions. In this sense, it is important to note that, even though the ecology established by the teacher was exactly the same for the entire group of students, the learning was significantly different for each of them. This is mainly due to the fact that not only individual and group aspects were taken into account, but also contextual, social and cultural factors that influenced the learning experience. In the experience described, each student appropriated the knowledge related to the part directly linked to their discipline of study, adapting the described learning ecology to their particular process, without leaving aside the general context initially proposed by the course teachers. On the other hand, the development of skills related to intercultural awareness, responsibility, participation and empathy was notorious. Likewise, there was the

establishment of international research connections, which could lead, in the future, to the development of joint research with the participation of colleagues from different Ibero-American countries. The purposes of socialization, qualification and subjectivation were also developed by both students and teachers, constituting an experience of education for global citizenship.

These results indicate that the described experience encouraged students to deepen their learning, developing additional research to establish connections between the themes of study and the contents addressed by the invited teachers, thus building their own knowledge, especially highlighting the conditions and contours for the development of Technological-Pedagogical Fluency (FTP) of all those involved in educational events of this complexity and amplitude. At the same time, the training of students as global citizens was promoted, teaching them to work in the context of the digital society permeated by the ethical challenges of freedom of access and production of content, as well as interactivity and socio-cultural interactions. It is important to highlight that this research is based on a single case study, and a greater number of experiences are needed to consolidate the proposed ecology.

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Plastics, microplastics, and human contamination: A literature review

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Marina Rocha de Carvalho[1], Alef Fontinele Teixeira[2], Luana do Nascimento Dias[3], Danielle de Jesus Silva[4], Suzany Pedrosa Nascimento[5], Gabriel Estevão Nunes Pereira[6], Graziela Santos Leite[7], Jamile Gabriela Almeida Silva[8], Jackson Rodrigues Mendes[9], James Werllen de Jesus Azevedo[10], Marcelo Henrique Silva Lopes[11] and Antonio Carlos Leal de Castro[12]

ABSTRACT

Plastics are synthetic materials produced through the polymerization of monomers derived from oil or gas. Plastic waste causes several problems, affecting the environment, marine life, biodiversity, and the functioning of ecosystems. Plastic fragments can be ingested by various species, occurring records in the digestive system of various organisms. Microplastics (PMs) include small plastic particles ranging from 1 µm to 5 mm in size and are currently identified as one of the emerging environmental contaminants of greatest concern in aquatic ecosystems, especially in the marine environment. Microplastics can be transported into the body by dermal contact, ingestion, inhalation, and transfer through the food chain. The bioaccumulation of PMs can cause internal and external lesions, ulcers, blockage of the digestive tract, among other lethal and sublethal effects. Microplastics that enter the human body can contain chemicals that cause cancer, DNA mutations, toxic effects on reproduction, hormonal disruption, and affect various organs. Recurrent sources of microplastic for the aquatic system are sewage, drainage systems, tire wear, and plastic waste that is poorly managed or discarded on beaches. Microplastic contamination generates a decrease in fish stocks, influencing populations living in the vicinity of contaminated environments, such as the population living near the ALUMAR Private Use Terminal, São Luís, Maranhão. Therefore, research with microplastics is of fundamental importance for improving the quality of life of the population and the environment and can be associated with several Sustainable Development Goals (SDGs).

Keywords: Environmental pollution, Microplastic pollution, Microplastic contamination.

[1] E-mail: marina.carvalho@discente.ufma.br
[2] E-mail: alef.fontinele@discente.ufma.br
[3] E-mail: dias.luana@discente.ufma.br
[4] E-mail: danielle.js@discente.ufma.br
[5] E-mail: suzany.pedrosa@discente.ufma.br
[6] E-mail: gabriel.estevao@discente.ufma.br
[7] E-mail: graziela.leite@discente.ufma.br
[8] E-mail: jamile.almeida@discente.ufma.br
[9] E-mail: jackson.mendes@discente.ufma.br
[10] E-mail: james.werllen@ufma.br
[11] E-mail: marcelo.silva@ufma.br
[12] E-mail: alec@ufma.br

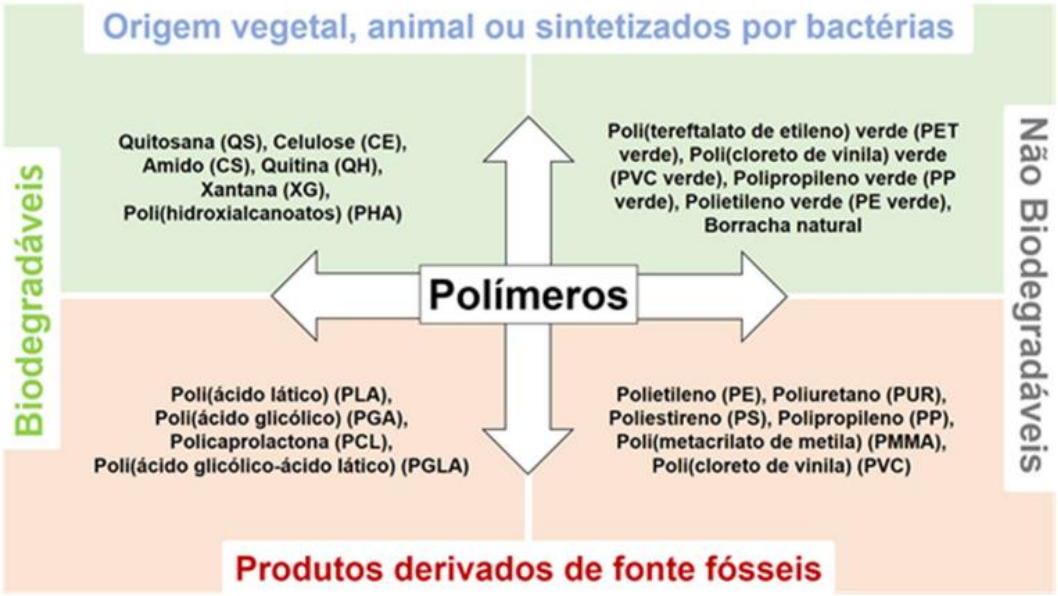
INTRODUCTION

THE USE OF PLASTIC IN THE WORLD

Plastics are synthetic materials produced through the polymerization of monomers derived from oil or gas, often accompanied by the incorporation of various chemical additives aimed at enhancing their properties. These additives contribute to giving plastics a high resistance to corrosion, in addition to significantly reducing their thermal and electrical conductivity (Barnes *et al.*, 2009a).

França *et al.* (2022) advocates other ways of classifying polymers, such as relating their origin and properties in the context of whether or not they are biodegradable (Figure 1). Polymers from non-renewable sources are those that derive from resources that do not form or renew themselves in a short period, such as the example of commercial materials made of polystyrene (PS), Polyethylene (PE) and Polypropylene (PP).

Figure 1. Types of polymers and their potential for biodegradation



Fonte: França *et al.* (2022)

Currently, plastics are identified as one of the emerging types of environmental contaminants of greatest concern in aquatic ecosystems, especially in the marine environment (Alvarez *et al.*, 2020; Ribeiro, 2022; Hernandes, 2023). In 2010, between 4.8 and 12.7 million tons of plastic waste from the continent were discharged into the ocean, representing 1 to 4% of the estimated total volume of waste generated that year and 2 to 6% of the total waste disposed of (Jambeck *et al.*, 2015; Mizoguchi, 2019).

According to Eriksen *et al.* (2014), approximately 5 trillion pieces of plastic are floating in the oceans, being dispersed by sea currents. One of the consequences of this situation is the formation of the Great Pacific Garbage Patch (GPLP), an area where it is estimated that there are 79

thousand tons of plastic waste in an extension of 1.6 million km² (Mizoguchi, 2019).

The Brazilian Government's National Plan to Combat Litter at Sea (Brazil, 2019) points out that approximately 80% of the garbage present in the oceans consists mainly of plastics, cigarette filters, rubber, metals, glass, textiles and paper, which originate on the continents. This suggests that the problem of solid waste is intrinsically linked to the poor management of these materials.

The growing use of plastic was driven by the COVID-19 pandemic, a period that was marked by the exacerbated consumption of single-use plastic materials, such as masks, gloves, syringes used in vaccination, packaging, and delivery utensils (Tardim; Almada, 2022)

To mitigate the impact of plastic on the environment, several measures have been explored for decades, such as the 4R strategy, which includes reduction, reuse, recycling and recovery (Klemeš *et al.*, 2020). Reduction implies a series of tactics aimed at reducing the consumption of single-use plastic products by the population and companies, and this approach has been implemented for years as part of environmental policies in many countries (Fletcher, 2023).

According to the UN (2023), plastic waste implies several problems for the environment, causing impacts on marine life ranging from physical or chemical damage to individual animals, to broader effects on biodiversity and the functioning of ecosystems.

Plastic fragments have been discovered in the digestive systems of aquatic organisms, including all species of sea turtles and nearly half of the seabird species and marine mammals surveyed (Jambeck *et al.*, 2015; Nelms *et al.*, 2016; Gall, 2015; Claro *et al.*, 2019; Almeida *et al.*, 2023) . This material poses a high risk, as they disintegrate over time into smaller sizes, known as microplastics and nanoplastics, which can have significant adverse impacts (Araujo, 2022).

MICROPLASTICS

Plastics can be classified for size into macroplastic and microplastic. It is distinguished as macroplastic when it has a size greater than 25 mm, which is the cause of visual pollution (Derraik, 2002; Gregory, 2009, Heip *et al.*, 2009). Macroplastic, when available in the environment, is exposed to ultraviolet radiation, temperature, oxidation, biodegradation, chemical agents and physical abrasion, and can generate smaller particles, microplastics (Athapaththu *et al.*, 2020).

Microplastics include all small plastic particles ranging from 1 µm to 5 mm in size (Cold; Nash, 2019). Because they have a very small size, they are considered bioavailable, that is, available for the accidental or intentional incorporation of an organism (Elías, 2015). They represent a large group of polluters that are made of different materials and can come in different sizes, shapes, and colors (Kiliç *et al.*, 2022).

According to Chart 1, it is possible to identify the problems of plastics and their subdivisions, including their detection and examples found in the sea.

Table 1. Garbage at sea: Detectability

	Garbage in the Sea: sizes					
	Size	Nano (< 1 nm)	Micro (< 5 mm)	Meso (< 2.5 cm)	Macro (< 1 m)	Mega (≥ 1 m)
Garbage in the Sea: detectability and examples	Detection/Method of Identification	Need for special detection methods, since smaller particles are not detected by microscopes.	It often needs microscopes and instrumentation to confirm that it is plastic; Larger items: visible/identifiable With the naked eye.	Visible/identifiable to the naked eye.	Visible/identifiable to the naked eye.	Visible/identifiable to the naked eye.
	Examples of Garbage at Sea	Nanofibers from clothing; rubber powder tire wear; nanoparticles in products. They have not yet been detected as litter due to technical limitations.	Microbeads in personal care products; fragmentation of existing products (plastic); polystyrene; plastic from shipyards; particles of incineration waste.	Bottle caps; filters and cigarette butts; plastic pellets; waste carried by the wind or carried by storms.	Beverage bottles and cans; plastic bags; food packaging; other packaging; disposable cutlery; beer seals; fishing lines, floats and buoys; Tires; Tubes; Balloons; toys; textile.	Abandoned fishing nets and traps; Strings; Boats; plastic films; polyvinyl chloride (PVC) from construction activities.

Source: Watkins and Brink (2017).

Plastic and microplastic pollution are global problems and their introduction into the aquatic environment can occur from various anthropogenic sources. According to Zhou (2020) and Khalid *et al.* (2021), the most recurrent sources of microplastic to the aquatic system are sewage, municipal drainage systems, tire wear, poorly managed plastic waste or even discarded on beaches.

Some microplastics are absorbed by the body in the form of small pellets, which are small granules of plastics that constitute the main way in which plastic resins are produced and marketed (Nobre and Sousa, 2022). They constitute raw material in the manufacturing industries, originating the most varied objects, which are produced after their melting and molding of the final product (Manzano, 2009) or in cosmetics (Fendall; Sewell, 2009). They can also be released by accidental spillage, such as virgin plastic granules (Barnes *et al.*, 2009b; Elías, 2015).

Microplastics are plastic particles smaller than 5mm, they are classified into two forms: primary and secondary. Martins (2023) points out that the primers come from the transformation processes of polymers or products from the detachment of materials containing polymers and their arrival in the environment can be voluntary (disposal) or involuntary (abrasion of polymeric items). According to Montagner (2021), these are materials used in the formulation of cosmetics such as

glitter, personal hygiene products (scrubs, soaps, and toothpastes) and also in pellet format, the configuration of plastic raw material.

Secondary plastics, on the other hand, originate from the fragmentation of larger plastics such as plastic bags, bottles, fishing nets and agricultural activities, such as the application of sewage sludge, vinyl coatings (Nizzetto *et al.*, 2016; Milološa *et al.*, 2022). In freshwater environments, primary sources of PMs such as textiles and cosmetics, electronic equipment, tire abrasion through driving, city dust, road construction, and marine lining are reported (Rezania *et al.*, 2018; Prokicet al., 2019; Milološa *et al.*, 2021).

MPs draw attention from all over the world due to their chronic contamination. Kiliçet al., (2022), states that microplastics have become a major concern for aquatic environments due to their intense concentration. Microplastics are ubiquitous in the environment and are currently classified as emerging contaminants (Montagner, 2021). The potential risks to living beings, as well as the levels of contamination in different environmental compartments, need to be better elucidated, so this new class has been the focus of research worldwide.

In view of these sources of contamination, Brahney (2020) estimates that the amount of plastic waste in the environment will reach 11 billion tons by 2025, most of which will be in the aquatic environment.

CONSUMPTION OF MICROPLASTICS AND SDGS

Although most studies have been directed to macroplastics over the last decades, there is currently a greater concern with smaller plastics, which due to their long permanence in the aquatic environment constitutes a growing risk of exposure to toxic agents for the biota.

Microplastic pollution has become an emerging global environmental issue. A growing body of evidence indicates that microplastics have been detected in the aquatic environment, atmosphere, biota, and even in humans, raising concerns for food safety and human health (Zhang *et al.*, 2022).

Many studies and official records indicate that microplastic contamination in marine ecosystems is mainly caused by river and terrestrial sources (Gasperi *et al.*, 2014). Transported from the aquatic environment or resulting from the decomposition of larger plastic debris (Cole *et al.*, 2011), microplastics represent the most abundant and dangerous fraction of marine plastic pollution (Eriksen *et al.*, 2014). The physical properties of particles, hydrodynamic conditions, and biofouling influence the fate of microplastics and their effects on marine ecosystems (Kowalski; Reichardt; Waniek, 2016; Kaiser; Kowalsky; Waniek, 2017).

This pollutant, when discarded into the environment, becomes bioavailable to organisms. Microplastics can be transported into the body by direct contact, i.e., dermal contact, ingestion, inhalation, and transfer through the food chain (Samandra *et al.*, 2022). Islam (2022), states that the

bioaccumulation of PMs can cause internal and external lesions, ulcers, blockage of the digestive tract, among other lethal and sublethal effects. Approximately 74,000 to 113,000 microplastics enter the human body annually through caloric intake and inhalation (Mak, 2020; Caixeta., 2022).

Even with few reports on their impact on humans, direct contact with these polymers can trigger several diseases. Wright and Kelly (2017) warn that many of the HOCs are highly toxic, resulting in endocrine disruptions, carcinogenic, mutagenic and immunotoxic effects in the human body.

As pointed out by the UN (2023), the totality of the impact on human health has not yet been fully understood, since research is at an early stage. However, Almeida (2021) warns that microplastics can contain harmful chemicals that, when incorporated into the human body, can cause cancer, DNA mutations, toxic effects on reproduction, hormonal disruption, and mainly affect internal organs such as the liver, kidneys, heart, nervous system, and reproductive system.

In view of this scenario, goals were established to control and mitigate global contamination, an initiative that began in 2015 with the 2030 Agenda for Sustainable Development. This agenda comprises the 17 Sustainable Development Goals (SDGs), which cover 19 targets and 230 indicators to be achieved over 15 years. Its main objective is to encourage the participation and cooperation of the 193 Member States of the UN General Assembly on issues of environmental, economic and social importance (UN, 2015).

When considering research with microplastics, with the objective of improving the quality of life of man and the environment, the objectives that can be associated are: SDG 2, SDG 3, SDG 5, SDG 6, SDG 11, SDG 12 and SDG 14 (Chart 1).

Table 1. Objectives and targets associated with the sustainable development of the coastal zone.

ODS	OBJECTIVE	GOALS
2. Zero hunger and sustainable agriculture	end hunger, achieve food security and improved nutrition, and promote sustainable agriculture.	**2.1:** By 2030, end hunger and ensure access for all people, in particular the poor and people in vulnerable situations, including children, to safe, nutritious and sufficient food all year round.
3. Health and Wellness	ensure healthy lives and promote well-being for all people, at all ages.	**3.9:** By 2030, substantially reduce the number of deaths and illnesses caused by hazardous chemicals and pollution and contamination of air, water, and soil.
		3.c: Substantially increase health financing and the recruitment, development, training and retention of health workers in developing countries, especially in least developed countries and small island developing states.
		3.d: Strengthen the capacity of all countries, in particular developing countries, to warn, reduce risk and manage national and global health risks.
		3.1: By 2030, reduce the global maternal mortality rate to less than 70 per 100,000 live births.
5. Gender Equality	Achieving Gender Equality and Empowering All Women and Girls	**5.5:** Ensure the full and effective participation of women and equal opportunities for leadership at all levels of decision-making in political, economic and public life.
		5.c: Adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and empowerment of all women and girls at all levels.
11. Sustainable Cities and Communities	Making Cities and Human Settlements Inclusive, Safe, Resilient, and Sustainable	**11.1:** By 2030, ensure access for all people to adequate and safe housing and basic services, as well as to significantly improve public transport, with particular attention to the needs of people in vulnerable situations.
		11.3: By 2030, increase inclusive and sustainable urbanization, and capacity for participatory, integrated, and sustainable planning and management of human settlements in all countries.
		11.6: By 2030, reduce the per capita negative environmental impact of cities, including by paying special attention to air quality and management of municipal and other waste.
12. Sustainable Consumption and Production	Ensure sustainable consumption and production patterns	**12.1:** Implement the Ten-Year Programme Plan on Sustainable Production and Consumption, with all countries taking action, and developed countries taking the lead, taking into account the development and capacities of developing countries.
		12.2: By 2030, achieve sustainable management and efficient use of natural resources.
14. Life on Water	Conserving and Sustainably Using the Oceans, Seas and Marine	**14.1**: By 2025, prevent and significantly reduce marine pollution of all kinds, especially from land-based activities, including marine debris and nutrient pollution.

	Resources for Sustainable Development	**14.3:** Minimise and address the impacts of ocean acidification, including through scientific cooperation at regional and global levels.

Source: Modified from United Nations Brazil (2023).

THE RIVERSIDE POPULATION AND THE CONSUMPTION OF CONTAMINATED LOCAL FISHERIES

As disclosed by the United Nations (UN) in its report on "World Environment Day" 2023, it is estimated that annually between 19 and 23 million tons of plastic waste are dumped into lakes, rivers, and seas. This amount is roughly equivalent to the combined weight of 2200 Eiffel Towers, which has opened the door to the contamination of fish species around the world.

According to Ory *et al.*, (2018), the fishing and aquaculture industry has been affected by the reduction in the number of organisms and species, generating economic and ecological losses. Direct and constant contact with MPs generates a decrease in the fishing stock, influencing the population that survives in the surroundings of contaminated environments, as occurs with the population that lives in the vicinity of the ALUMAR Private Use Terminal, São Luís, Maranhão.

Silva (2012) stated that ALUMAR's facilities attracted workers and land grabbers and that, from the 70s onwards, the occupation intensified. Cavalcante (2016) defines the area of this complex as a stronghold for the conservation of the main ecosystems that still encompasses a system of life of traditional peoples, that is, artisanal fishermen and agroextractivists.

Thus, the consumption of fish contaminated by microplastics in the area of influence of ALUMAR's TUP may be carried out by the surrounding community, causing great concern, since according to Santos (2015), about 58% of this population does not have access or has difficulty accessing health services.

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Knowledge management as a tool to support auditing in federal educational institutions

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Abdo Dias da Silva Neto[1] and André Luis de Oliveira Silva[2]

ABSTRACT

This study examines a Federal Institute of Education, Science and Technology, focusing on the effects of internal and external control on managers' actions and their perception of audits. Using structured questionnaires, data were collected from key managers to assess the value of the knowledge acquired and its dissemination. The objective is to integrate various knowledge to improve performance in the face of internal and external control requirements. The results indicate that the application of knowledge management tools can improve the dynamics between managers and internal audit, promoting a more efficient and transparent administration. In addition, the survey seeks to identify best practices in the implementation of these tools, considering the specific challenges of the federal education sector. Detailed analysis of the data reveals that continuous training of managers and the creation of an organizational culture focused on knowledge sharing are crucial for the success of audits and compliance with regulations. Finally, the study proposes recommendations to improve knowledge management policies in federal educational institutions.

Keywords: Knowledge Management, Internal Audit, Internal Control, Federal Institutions, Education.

[1] Master in Public Management
UFES – Federal University of Espírito Santo
E-mail: abdo@ifes.edu.br
ORCID: https://orcid.org/0000-0003-2353-7057
[2] Bachelor of Laws
Doctum
E-mail: andreluisos@msn.com
ORCID: https://orcid.org/0009-0000-4005-7843

INTRODUCTION

There are many management problems found in Brazil, among them it is common to see irregular hiring without public tender, the diversion of public funds and the traditional irregularities in bidding. Many complaints are taken to the Federal Court of Accounts (TCU), to occur in administrative penalties, but many reach the Superior Court of Justice aiming at a civil and criminal penalty.

Without exhausting the theme, Marçola (2011) shows in his work two facts that can explain the lack of motivation on the part of the manager to create or equip the Internal Audit: "lack of understanding about the importance of the advisory work carried out by the Internal Audit as well as about its functioning, and fear that the creation of the unit may restrict its freedom of direction."

Courses that qualify civil servants for this arduous mission are rare. Improbity is born from this mismanagement, and this act of improbity can generate a gigantic loss to the treasury, not to mention the ethical and moral scars that are marked in social history.

These attitudes without commitment, full of perceived malpractice during the performance of administrative assignments, can affect a city, a state or even the entire nation. Bogoni et al. (2010), within this approach, say that the citizen is a "shareholder" of the State, as he contributes in various ways to its maintenance (taxes, contributions, fees...). Thus, the citizen has the right to intervene and influence the decisions of the State, but for this control is necessary.

The lack of effective control can lead to a reduced number of punishments for civil servants. In the reports of OLIVEIRA *et al.* (2010, p.2) state that the certainty that control can improve in the bodies of the Indirect Administration must be driven by its own conceptual theory and duly dragged into practice. Thus, to establish a better relationship of trust between the citizen and the public administration, "accountability, transparency, equity and responsibility" must be given.

When inspection is allowed in an Indirect Administration body, Bourgon (2010) clarifies that inspection will ensure that public office holders are duly held accountable for the exercise of their power, reducing impunity, promoting transparency, encouraging citizen participation in the public policy cycle to ensure representation of their interests in a broader and more equitable way.

Marçola (2011) brings the experience of having lived the creation of control in a public agency in the State of São Paulo with the adequate equipment of materials and human potential, this made him conclude that:

> [...] the main result of the Internal Audit in the Public Administration was the establishment of a culture of partnership between the internal auditors and the civil servants, to the extent that the latter began to understand and even request the presence of internal auditors in order to analyze procedures and internal controls, with the aim of verifying the degree of reliability and improving them and, therefore, positively impact the audited area.

Still with regard to impunity and aversion to control, Bergue (2011, p.44) points out that the vision of the manager who seeks power is inversely proportional to his ambition for control: "the imperative of control is directly proportional to the amount of power; and the desire that the public agent nurtures for power is inversely proportional to what he has for control". According to the author, in order to have a functional control structure in the organization, it would be necessary to have managers more committed to the institution's goal and objectives than to personal power.

It is not possible to say, as has already been said, that by itself the training and qualification of civil servants inhibit mismanagement. Matias-Pereira (2010, p.66) argues that the effective presence of control mechanisms is necessary to foster a space that "requires an ethics that values the collective solution and the construction of society with relationships that are based on citizenship and equality".

One solution seen by the Office of the Comptroller General of the Union is to train not the civil servant, but the citizen. The objective in mind would be to increase the power of inspection of public spending through courses such as "Social Control and Citizenship", which is in its 19th edition, or even the "Access to Information Law".

Mano (2011) emphasizes the careful analysis of the news that is published in the media, showing that there is a consensus in the organized segments of society of priority in dealing with corruption and improving public management as a whole.

THEORETICAL FRAMEWORK

Thus, it is known that good management will be successful if it adheres to the principles of organization, planning, command and control. But, for that, the support of the State is necessary. In the words of Matias-Ferreira (2010, p.192):

> [...] strengthening relations between the State and society is an important investment that leads to the improvement of public policies, a fundamental element of good governance, allowing the government to obtain new sources of relevant ideas, information and resources for decision-making.

For Matias-Pereira (2010, p.75), it is officially established that the unrestricted competence of the State in a system of government supported by the pillars of democracy is to create mechanisms that "stimulate the participation of society, defining specific guidelines for its participation in decisions, in the monitoring and inspection of public policies".

It is also necessary to take into account, what is pointed out by the CGU, since audit reports are subjective. This is a weakness pointed out by Datta Pratim and Nwankpa Joseph (2012) who say as follows:

> [...]Audit reports are formal auditor opinions based on their perceptions of an organizational system. It is well established that the quality of an audit report is based on the auditor's perceptions. Audit quality is a subjective assessment of the likelihood that the auditor will

> discover and report a breach in the organization's system. The perceived quality of an audit focuses on providing reasonable assurance that the financial statements are free of material errors (caused by error or fraud).

Among other problems involved in the audit work, the manager's lack of commitment to compliance with the recommendations is also mentioned. In short, non-compliance does not depend only on the monitoring by the IFES support servers, but on the willingness and ability of the managers to solve the problems pointed out by the Internal and External Control.

In addition to the difficulties already mentioned, there is also the fact that there is an abyss between auditing and management when it comes to planning and strategy to solve the questions raised and the administrative deviations that occurred. It is believed that this distancing leads to a loss in the production process, which leads us to a low performance in meeting the requests studied, as the environment becomes less "auditable".

To overcome these dysfunctions and better understand the management deficiency, Moritz and Pereira (2010, p. 120) report some alternatives that would enable the improvement of control and management and that will be seen in this work:

a) The search for legitimate and safe information to guide decisions (management advice provided by AUDIN);

b) Have clear goals regarding the results you want to obtain;

c) Establish indicators of priorities and allocation of resources (Balanced Scorecards);

d) Ensure autonomy to correct inappropriate courses of action with the necessary speed (Planning).

The absence of indicators makes the manager lose the dimension of the failures existing in the agency. It is also emphasized that, even if there are reliable indicators, extracted from reliable systems (another problem in IFES), its correct use is essential, thus making it possible to evolve local management techniques.

The lack of a routine search for indicators, hindering the general view of the institution and its programs by managers. There must be a cultural change that affects the server's routine. According to Cherman and Rocha Pinto (2013, p.148),

> [...] At this moment, the organization, through the established routines and models, the ways of acting and the interventions of senior management, emerged as "the other" that seems to lead the organizational guidelines to be followed, as well as the knowledge to be valued by individuals. It is suggested that the incorporation of knowledge in the social construction of the subjects follows the organizational guidelines, to the extent that the subjects consider, in their articulations, both the attributes of importance to formally established knowledge and the organizational models through which the valuable knowledge will be absorbed.

The investment in the collection of information for the formulation of indicators would help the rectory, the highest level of the IFES organizational structure alongside the Superior Council, to

relate the results of what is done administratively with the objectives and strategies of the organization.

METHODOLOGY

The methodology of this study is quantitative and exploratory in nature. The technique of data collection was used through structured questionnaires applied to managers of a Federal Institute of Education, Science and Technology. The questionnaire was developed based on models validated by Kaplan and Norton (2016) and adapted to the reality of the public sector. Data analysis was carried out using descriptive statistical techniques, with the objective of evaluating managers' perception of the usefulness of internal audits and the implementation of knowledge management practices.

In addition, a literature review on knowledge management and auditing was conducted, including recent works by authors such as Nonaka and Takeuchi (2019), Davenport and Prusak (2020), and Choo (2018), to theoretically support the study.

RESULTS AND DISCUSSIONS

Senge (2022) reinforces that organizational learning is essential for the development of skills that support knowledge management. He says that institutions that promote a culture of continuous learning are better prepared to face the challenges posed by rigorous audits and stricter internal controls.

By adopting this idea, Perez Jr. et al. (2011) say that dealing with the "adequate calculation, analysis, control and management of the various costs of goods and services are old concerns of entrepreneurs and managers of organizations." Such routines are due to the desire of every organization to continuously seek a more competitive positioning, and to evolve its processes to achieve the real intentions of society.

It is important to infer that the indicator, in a planning routine, as the name well defines it, only indicates, it does not correct flaws, it only acts as an alert pointing out when the process is generating desired or unwanted results.

The constant collection of data from the processes, the preparation of indicator graphs and the analysis of this information is what allows managers to know the performance of the institution or if the process is out of control, requiring corrective action. Through the words of Nascimento (2010, p. 25), it is evident that:

> Performance cannot be measured by an isolated dataset showing the results achieved. It is necessary that they be confronted with pre-established goals or standards, or compared with the results achieved in previous periods, thus obtaining a historical series for analysis.

It is necessary to learn to live with indicators, this culture will build more complete and reliable management reports that will allow recording histories, as well as making a broader analysis of the performance of IFES by the Rectory.

It is also important to systematize this process, to make it simple to track indicators within the Educational Institution. For Rummler and Brache (2013), an organization depends on good management to be greater than the sum of its parts. Good management and effective management of an institution will only occur when it has a performance measurement system supported by indicators related to the organization's objectives and goals.

It is certain that a set of isolated data, which form indicators, does not say much if they are not confronted with the goals of the administration. If IFES really seeks excellence in its services, but without renouncing economy, efficiency, efficacy and effectiveness, the use of indicators that help in managerial decisions must be paramount.

From there, Rummler and Brache (2013) conclude that without measurements the expected performance is not achieved, with wrong measurements it is not possible to optimize performance, because only measurement allows the monitoring and improvement of the system.

It is then clear that the indicators will not only help in achieving the goals defined by the managers, but will be able to help the Internal Audit to form an opinion on the performance of the audit object, also contributing to the improvement of the existing monitoring and evaluation systems.

It also contributes to the transparency given to society, as they demonstrate how public resources are being used and whether the results are being achieved. It is feedback that feeds the organizational learning process. The Federal Court of Auditors, through its Technical Bulletin of Performance Indicators for Audits (BRASIL, 2011, p. 10) teaches us that:

> Thus, from the point of view of society, the IDs (Indicators) contribute to transparency on how public resources are being used and on what results are being achieved. From the point of view of the public organization, indicators are part of the performance feedback system and feed the organizational learning process. For the control agencies, the existence of good monitoring and evaluation systems, of which the indicators are part, make the environment more auditable. It is, therefore, a tool for both planning and control.

In 2022, the need for more effective and transparent control was further emphasized due to increased regulatory requirements. Nonaka and Takeuchi (2022) point out that knowledge management plays a crucial role in adapting institutions to these new demands, providing the necessary resources and tools to ensure compliance with current regulations.

The indicators that will be built with the support of the research carried out should be based on principles of administration such as economy and legality linked to the perspectives of the Balanced Scorecard (BSC). For Kaplan and Norton (1997, p.7) the BSC "reflects the balance

between short and long-term objectives, between financial and non-financial measures, between indicators of trends and occurrences, and between internal and external perspectives".

Literally translated into Portuguese, Balanced Scorecard means balanced scorecard. In the administrative area, it is a management model based on indicators that allow a financial, marketing, production and growth analysis or learning of the worker.

Initially, this technique was directed to the private sector, but later Kaplan and Norton (1997, p.188) saw the opportunity to use the balanced score to improve the management of public companies and non-profit institutions. In this context, Kaplan and Norton (1997, p.145) began their work for the government sector in 1996, which led the BSC to gain worldwide scope in the following four years, with the use of the new method in several public institutions.

Even so, for Kaplan and Norton (1996), the Balanced Scorecard should not be treated only as a control tool, but as a strategic management system. This system would be based on four objectives that relate the aforementioned short- and long-term objectives:

The first objective would be the TRANSLATION OF THE VISION. By its concept, a strategy must be created that links the organization's vision to the perspectives where key performance indicators should be built. In short, senior management must translate the company's vision and objectives into measurable indicators.

The second objective is COMMUNICATION AND CONNECTION: as soon as a Balanced Scorecard indicator is developed by the entire organizational structure of an institution, the strategy must be accessible to everyone. In any case, it is essential that, as the BSC moves down the hierarchical scale, a compensation policy must be present so that everyone who contributes benefits, thus fueling the dissemination of the global strategy.

The third objective is STRATEGIC PLANNING: Strategic and budgetary organization must go together. The achievement of objectives generates costs and the budget must bear them. Having the objectives in hand, appropriate performance indicators are created that must be committed to the success of the strategy.

The fourth objective focuses on FEEDBACK AND LEARNING: The Balanced Scorecard comprises a modern communication tool. Through its creation, it is possible to obtain feedback between the top of the organization and the operational, allowing the institution to reflect and possibly correct its mistakes. This automatically refers to the improvement of the quality of its procedures, identifying its weakest link in the cause-effect relationships.

The above meets the model proposed by Kaplan and Norton (2000, p. 148) regarding the perspectives of the BSC for the public sector.

So, in order to meet the principles of management and consequently the mission of IFES, this research will offer useful indicators to clarify the new directions that should be adopted by the

administration, in an attempt to increase its performance and reduce the number of recommendations proposed by the audit work. In this way, for Kaplan and Norton (1997, p.9), a planning capable of

> […] clarify and translate the vision and strategy; communicate and link strategic objectives and measures; plan, set goals and align strategic initiatives; and improve feedback and strategic learning.

Many organizations have been adopting strategic planning and indicators – Balanceds Scorecards – as management tools, and with this survey, AUDIN is created the beginning of the application of this strategy aimed at helping management. Next, a model is created, which will be presented to AUDIN and the current management of IFES, remembering that such a model may undergo future changes or reinterpretations in order to adapt to the context.

Despite the excellent applicability of the indicators to audit and management activities, it was up to the TCU to warn about their use in the Technical bulletin of performance indicators for audits (BRASIL, 2011, p. 08) as follows:

> It should be noted that performance indicators can provide a good view of the performance that is intended to be measured, but they are approximations of what is actually happening, always requiring interpretation in the context in which they are inserted.

This work directly suggests the immediate creation of the routine application of indicators, preferably from the BSC, as a way to modernize management and make audit recommendations no longer accumulate so frequently.

It is necessary to understand the results, through indicators, so that we have an idea of the effectiveness or success of the system. Thus, success or efficiency is the ability to solve a systemic problem.

To demonstrate the effectiveness of the system, it is necessary to directly relate what was intended to be done and what was actually achieved. In short, success or effectiveness is a condition defined by the solution of a problem, meeting a need, or achieving any goal.

The concept of efficiency necessarily presents different contours in private and public organizations. In the public sector, what should prevail is the interest or need of the citizens, in the private sector, the financial interest and those of their owners and the maximization of profit predominate.

An example of the search for efficiency was the fact that the Federal Government, through the Secretariat of Public Management – SEGEP (Ministry of Planning, Budget and Management – MPOG), revitalized the National Public Management Program – GESPUBLICA with the scope of seeking management models capable of contemplating the demands of society in an effective and effective way. Palvarini (2010, p.01) analyzed GESPUBLICA and described its characteristics as follows:

> […] its main characteristics are the fact that it is essentially public oriented to the citizen and respecting the constitutional principles of impersonality, legality, morality, publicity and efficiency, of being contemporary in line with the state-of-the-art of management, of being focused on the provision of results for society with impacts on the improvement of the quality of life and the generation of the common good and of being federative with application to the entire public administration, in all branches and spheres of government.

GESPÚBLICA's strategy is similar to the CGU's strategy, both seek the voluntary mobilization of citizens. They invest in the transformation of a citizen into a transforming agent of public management.

GESPÚBLICA, in particular, follows a tactic of evaluating bodies with stratified classes of points, and it is believed that the objective is to compare national public institutions with international standards of quality in management. This idea corroborates some characteristics of the program, which focuses on results that must be achieved by entities that cannot and should not cease to be public.

The application of knowledge management tools in higher education institutions is key to promoting a more efficient and transparent public administration. According to Choo (2020), well-managed organizational knowledge can lead to significant improvements in decision-making and policy implementation. Institutions that adopt robust knowledge management practices tend to present better results in internal and external audits.

The COVID-19 pandemic in 2020 accelerated the need for digital transformation in educational institutions, including the adoption of knowledge management practices. According to Senge (2020), the ability to quickly adapt to new technologies and remote work methods was crucial for the continuity of educational and administrative operations. This forced change highlighted the importance of effective knowledge management systems to ensure organizational resilience.

Recent literature also suggests that knowledge management can help reduce bureaucracy and increase administrative efficiency. According to a study by Choo (2021), the centralization of information and the standardization of administrative processes are essential to improve the operational efficiency of federal institutions. The adoption of these practices can lead to a more agile and transparent administration, facilitating the work of internal audits.

An important point highlighted by Choo (2022) is the need for continuous training for managers and employees of federal institutions. Adequate training in knowledge management and internal audit practices can significantly increase the effectiveness of administrative and control processes, contributing to more transparent and accountable management.

In this sense, seeking to increase the efficiency of Management, this work previously reported the importance of using Knowledge Management techniques and tools. All the data on servers, activities performed, effectiveness and efficiency refer directly to the importance of the division of

labor in organizations. In an organization, each person and each group of people has a specific role that converges to the realization of the mission.

In this way, you have organizations that specialize in certain missions, the people and groups that work in them are also specialized in certain tasks. It is the division of labor that allows individual limitations to be overcome. When you add up the small contributions of each one, you can make products and services that no one could make alone.

It is based on the use of the coordination of group work, and using refined techniques of public administration, that we believe in the modification of the behavior of IFES before the Internal and External Control bodies.

On the subject, Batista (2012, p.42) emphasizes that:

> The sum of the capacity of the public servants of a team contributes to increasing the capacity of the team, which will be as good as that of its members. When the public servants of a team are constantly learning and sharing knowledge among themselves, there is an increase in the work team's ability to achieve.

Before the necessary and expensive work of resolving the accumulated institutional issues, it is necessary to stop making technical mistakes. For this to occur, it is necessary to increase research in this important area of study. This study innovates in the use of Knowledge management in support of auditing work, in this sense, Batista (2012, p. 27) says that;

> [...] there are few studies in the Knowledge Management literature that, based on the specific characteristics of Public Administration, list critical success factors for the successful implementation of Knowledge Management in public organizations and propose specific models for Public Administration.

According to Batista (2012, p.27), "public organizations do not have references of specific models for public administration." The difficulty of finding ready-made and finished models of knowledge management systems is also scarce. This makes the manager's work difficult, who in many situations has no one or what to look up to.

In 2021, a study conducted by Davenport and Prusak (2021) revealed that institutions that invested in knowledge infrastructure and information technologies gained a significant competitive advantage. These organizations were able to respond more quickly to regulatory changes and audit demands, highlighting the importance of a strategic approach to knowledge management.

Nonaka and Takeuchi (2021) argue that the continuous creation of innovation within institutions is facilitated by an organizational culture that values knowledge sharing. They say that, for federal education institutions, the implementation of knowledge management practices can transform the way managers deal with audits and internal controls, promoting a culture of continuous improvement.

Davenport and Prusak (2022) highlight that the integration of knowledge management tools with auditing systems can result in greater accuracy and efficiency in internal control processes. Implementing digital platforms that enable real-time data collection, storage, and analysis can significantly reduce the time and resources required to perform audits.

CONCLUSION AND RECOMMENDATIONS FOR FUTURE STUDIES.

The present work sought to guide IFES, more precisely the Internal Audit, in the implementation of Knowledge Management methods and techniques in its activities to try to reduce the number of recommendations not met by the administration.

To this end, it was necessary to identify the perceptions of IFES managers about the role of guidance and advice in the pursuit of objectives and goals, within a general management context. In order to detect these perceptions, a questionnaire was carried out capable of demonstrating, through the managers' answers, the representative view of the audit work, addressing a theme of advice, information, communication and application of the fundamentals of Knowledge Management.

With the results of the research, it was observed that an administrative environment was not effective in terms of the professional interpersonal relationship of managers and Internal Audit. The tools and planning that must be proposed to systematize knowledge in the search to reduce management failures encounter common difficulties in many organizations such as; lack of knowledge in basic processes and procedures; absence of human resources for implementation; lack of financial resources; lack of a culture focused on working together with auditing; lack of information technology tools to assist the server's tasks and the lack of knowledge about the pursuit of organizational strategy.

The work also demonstrated, through the respondent managers, the distance of the Internal Audit from the managerial and advisory work, which may be a consequence of the little existing contact or the low frequency in the labor discussion of institutional tasks between the administrators and the auditors.

In this context, there was no presence of a policy for the execution of the operational audit to be commanded by the Internal Audit, whether it is a consequence of the lack of human material, or of its deficient regimental structure.

Finally, the research by Davenport and Prusak (2022) suggests that the future of knowledge management in federal education institutions lies in the combination of advanced technologies with innovative management practices. They conclude that in order to achieve more efficient public administration, it is essential to invest in knowledge management systems that support collaboration, innovation, and transparency.

It is also noted that the Internal Audit must reinforce its communication channel with managers at a higher hierarchical level, where the most expensive management processes occur, and where the most important decisions are often centralized.

The application of Knowledge Management tools should be more frequent in these places, so that it can respond with agility and quality to internal and external control. The application of the knowledge management system in Internal Audit will only be successful if there is a commitment to modern management practices, which makes it increasingly move away from the current bureaucratic model.

In this line of thought, it is also recommended to carry out studies in other Federal Institutes of Education in order to compare and contribute with news about the application of Knowledge management in the field of Internal Audits. The replication of the study with the necessary adaptations, in a research sample at the Federal University of Espírito Santo, is another suggestion. Surveys with on-site verification can contribute to explanations about the absence of control and transparency.

Finally, it is concluded that, due to the perceptions obtained in this research, it is necessary to immediately apply Knowledge Management tools so that Internal Audit and Management are in line with the new visions of public management. At another time, there must be a change in the way Internal Audit acts to not only seek divergences in legalistic issues, but to aim at better managerial results without ceasing to focus on the constitutional principles of economy, efficiency and effectiveness, to better provide its services to citizens.

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Proposal for a comprehensive security manual for the Ecuadorian public sector

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Máximo Ortega Galarza, Rodrigo Altamirano, Moisés Nikolay Trujillo Avilés, Pablo Patricio Naranjo Rodas, Máximo Leonid Ortega Coloma and Kathrina Samira Ortega Coloma

ABSTRACT

Institutions today have to be safe, healthy places where collective and individual well-being prevails, particularly for those who provide their personal and professional services in public institutions. It is mandatory at this juncture to seek and apply certain security instruments that allow us to optimize and guarantee the lives of the people who make up the Public Institutionality.

Keywords: Security, Services, Public Institutions.

INTRODUCTION

Institutions today have to be safe, healthy places where collective and individual well-being prevails, particularly for those who provide their personal and professional services in public institutions. It is mandatory at this juncture to seek and apply certain security instruments that allow us to optimize and guarantee the lives of the people who make up the Public Institutionality.

The modern administration must promote and guarantee the physical, emotional and social safety of its personnel installed in the Public Sector with a focus on the promotion of a preventive culture. The contexts of life in modern society encourage us to resign ourselves to certain usual paradigms and concomitantly to point as institutions of the State to a change in the habitual relations of man with the community.

The incessant automatism of man in today's society brings with it a lack of obvious opportunities for the development of security and personal protection, subjecting him on many occasions to being a victim of organized crime and insecurity. It is therefore necessary to manage and formalize security to prevent actions or acts that generate violations of human rights, violent deaths or other threats of any kind, creating a work environment in which physical, emotional, social, individual and collective well-being is promoted.

This document sets out several basic security rules that are aimed at protecting the life and coexistence of our public servants and workers, within the framework of respect for Human Rights and citizen guarantees. This instrument is a tool of great benefit to promote in this scenario of social emergency under the so-called decree of a state of emergency issued by President Daniel Noboa Azín for some provinces of Ecuador in which we are all willing and committed to the prevention of threats, intimidation and citizen insecurity.

We are aware that State Institutions, through their personnel, must participate not only in the projects inherent to the issue of security; on the contrary, we hope that they will be the same protagonists in the different proposals aimed at solving the problem of citizen insecurity that our country is experiencing, specifically in the different environments where we operate, especially in the workplace.

In this context, the instrument called the Comprehensive Security Manual must consider a series of preventive operations that agree to create a conscious commitment to improve the conditions of prevention in the daily life of the human being who is part of the Ecuadorian Public Sector in which the social commitment that opportunely encourages us to be more empathetic prevails. solidarity and participation in the field of improving Ecuadorian citizen coexistence.

GENERAL

In the general context of the community and in the commitment to accept some provisions to safeguard physical integrity and avoid any event that affects our existence. This is when the need arises to incorporate into our daily activity certain measures of community security and individual protection that are aimed at preventing any violent, terrorist, and punishable act, taking into consideration the geographical space where we live and work.

Only a change of positive personal attitude will allow us to have a clear dimension about institutional and personal prevention actions; The foregoing supposes a comprehensive look at the uncertain problem we are experiencing, since organized crime is not the simple occurrence of certain arbitrary acts or infractions, so it is necessary to address this problem with public policies aimed at public institutions that aim, among others, at the prevention of crime, the consumption of controlled substances, organized violence, robberies and recovery of public spaces to achieve a safer environment.

To this end, it is necessary to add to personal and work activities a succession of operations and measures necessary to avoid the generation of unsafe acts, as well as to expose oneself to them at the present national social moment and not to be victims of violent, terrorist, criminal activities and intimidation by organized criminal groups, common crime and trafficking in narcotic substances that cause fear and insecurity in the population.

We must be aware that any criminal act created can occur at any time and circumstance and therefore it is a priority to prepare ourselves with security initiatives to put them into practice and neutralize such events with possible solutions that minimize the risk and in turn guarantee the individual and collective security of public servants.

We hope that these basic rules of individual protection will be socialized in all institutions, as useful tools for prevention against the outcomes and possible organized crimes, insecurities and threats that have a social and individual impact so that we can act proactively; that is, anticipating events that may occur without putting personal integrity at risk.

INTRODUCTION TO INSTITUTIONAL SECURITY

Security consists of the defense of rights, it can be considered as a state of absence of dangers and conditions that can cause physical, psychological or material damage to individuals and to the institution in which we provide our services, such as any State agency. The conceptual development of this term arises and evolves within the social framework, where the role played by the State must be the expression of a concern for the centrality of people's rights in an insecure environment such as the one the country is currently experiencing, a socio-political phenomenon that is trying to be modified and whose origins are to be found in the competences of the organs of the State in the

materialization and satisfaction of basic conditions for the development of the rights of the State. social development.

Citizen security is not only the response given by the National Police in the event of an infraction, it is, primarily, the capacity of the State to underpin the necessary policies for the eradication of violence and insecurity and to achieve the peaceful coexistence of its community, in order to strengthen productive activity with a future projection. economic and social security of our country with the active participation of all actors involved in citizen security.

The semantic approach to a methodical condition within security, such as the language of institutional security, must start from the historical, social, political, ideological, cultural, economic and environmental context of the society from which it arises.

Citizen insecurity has recently become one of the central issues of concern for Ecuadorian citizens and, therefore, one of the issues to be resolved by the political leaders of the day, especially at the beginning of this century. The concern generated by the situation of insecurity and violence that is currently experienced in the national territory not only floods the usual conversations, but has also become a topic of discussion especially in the academic and scientific research fields.

Kris Bonner says: "The public's interest in organised crime has increased enormously in recent years. (....). Security is a necessary circumstance for the exercise of citizenship and the functioning of society, one of the main reasoning to ensure quality of life."

This document aims to provide specific information on issues of personal and institutional security and, above all, on individual protection standards. The main objective of this instrument is to offer a global vision of the knowledge in the field of institutional security that can serve as personal tools in the prevention of organized crime considered as a crime against the public security of the State and its organization.

SECURITY CONCEPTS

Citizen security is the summary of sponsoring, fortifying and preserving democratic civil order, eliminating threats of intimidation in the population and demanding a safe and peaceful coexistence. Therefore, it is necessary to place this issue in alignment with current legal regulations. It is a process of protecting the democratic civil order, allowing for safe and peaceful coexistence.

Citizen insecurity became one of the greatest concerns and challenges of governments and Ecuadorian society in this context, management capacities and resources become a strategic issue to be able to fully assume the issue of citizen security from the institutional level.

CONSTITUTION OF THE REPUBLIC OF ECUADOR

Article 158.- The Armed Forces and the National Police are institutions for the protection of the rights, freedoms, and guarantees of citizens. The Armed Forces have as their fundamental mission the defense of sovereignty and territorial integrity. Internal protection and the maintenance of public order are exclusive functions of the State and the responsibility of the National Police.

Public servants, the Armed Forces and the National Police shall be trained under the foundations of democracy and human rights, and shall respect the dignity and rights of persons without any discrimination and with unrestricted adherence to the legal system in force.

Article 163.- The National Police is a state institution, of a civilian, armed, technical, hierarchical, disciplined, professional and highly specialized nature, whose mission is to attend to citizen security and public order, and to protect the free exercise of rights and the security of persons within the national territory.

The members of the National Police will have training based on human rights, specialized investigation, prevention, control and prevention of crime and the use of means of deterrence and conciliation as alternatives to the use of force. For the development of tasks, the National Police will coordinate its functions with the decentralized autonomous governments.

LAW ON PUBLIC AND STATE SECURITY

Article 23.- Citizen security. - Citizen security is a State policy, aimed at strengthening and modernizing the mechanisms necessary to guarantee human rights, especially the right to a life free of violence and crime, the reduction of crime levels, the protection of victims and the improvement of the quality of life of all the inhabitants of Ecuador (NATIONAL ASSEMBLY, 2009).

In order to achieve solidarity and the reconstitution of the social fabric, it will be aimed at creating adequate conditions for the prevention and control of crime; organized crime; kidnapping, human trafficking; smuggling; of coyoterismo; drug trafficking, arms trafficking, organ trafficking and any other type of crime; of social violence; and the violation of human rights.

Priority will be given to preventive measures and service to citizens, registration and access to information, the implementation of citizen programs for the prevention of crime and the eradication of violence of any kind, improvement of the relationship between the Police and the community, the provision, measurement and impact of quality in each of the services, surveillance, assistance and response mechanisms, technological equipment that allows institutions to monitor, control, assist and investigate events that occur and that threaten citizens. (NATIONAL ASSEMBLY, 2009).

Security, as an expression of a vital human need, has been and is one of the central concerns of our society and governments since the last decade. As a social and cultural construction, security

is one of the icons of the crisis of modernization and social development, since in essence it implies certainty and the absence of risk or threat (Tudela 2001: 51-64).

Security involves not only not being victims of crime in public and private spaces, but also enjoying the validity of a Constitutional Rule of Law and a minimum or reasonable standard of well-being in matters of health, education, income, etc.

According to Michel Foucault (2010), security is a concept that was born together with liberalism, and refers to a way of governing with the aim of "Ensuring that individuals or the community are exposed as little as possible to dangers" (p. 86).

This leads to the implementation of control, coercion and coercion procedures around health (disease control and hygiene), crime, as well as the fight against "antisocial" behaviors and defense against threats external to the State, identified mainly in the action of other States. (Montero, 2013, p. 205).

Security is a situation in which States reflect that there is no danger of military attack, political pressure or economic coercion, so that they can freely pursue their development and progress.

PRINCIPLES OF CITIZEN SECURITY

The principle of citizen security has a legal basis with which an act is protected, being constitutional when its protection comes from the Magna Carta, for which it governs human conduct in terms of the dignity of the person.

Citizen security is the operation provided for and carried out by the State, with the support of citizens and other organizations of public interest, aimed at ensuring the harmony and peaceful development of life in society, as well as the extinction of violence.

In order to understand citizen security, it will be necessary to consider the following elements:

Human rights are inherent to all people, without distinction of any kind, such as race, sex, nationality, ethnic origin, language, religion or any other circumstance. These rights are attributed to all individuals, without any difference. It evokes the idea of possessing rights to manifest interest, which is recognized and assured, that is, there are mechanisms to make the promises of objective law enforceable.

Social equity "To place the proposal in a context of social justice in order to improve the quality of life of the population, as well as to mitigate the vulnerability of young people, the poor, women, children and ethnic minorities" (Jarrín, 2005, p. 47).

Civic culture It is the set of values, attitudes, behaviors and shared rules that generate a sense of belonging, promote improvement, facilitate harmony and lead to compliance with common property. It invigorates a true concatenated work between the State and the community, born from the

need for interaction and collaboration between citizens and institutions with a view to achieving the common benefit.

Participation "Strengthen organized and proactive citizen participation in the solution of problems related to violence in its different manifestations" (Jarrín, 2005, p. 48). Social relationship between State and society, is the interest in interacting and working for the common good, through the institutions of the State.

Social agreement "Promote agreements on policies and actions in which the different levels of the State (central, provincial, cantonal), the private sector and the organized population participate" (Jarrín, 2005, p. 48). It lies in the alliance between two or more people or entities on a matter, in this case in the social sphere.

Decentralization "The institutional framework of citizen security must decentralize competencies in local governments and apply the principle of subsidiarity to be efficient and effective" (Jarrín, 2005, p. 48). Governments apply decentralization, to achieve greater administrative and economic efficiency in the provision of scarce resources, transparency, subsidiarity and greater community collaboration of the inhabitants.

Inter-institutional cooperation "Promote inter-institutional synergy to improve the performance of the entities in charge of citizen security" (Jarrín, 2005, p. 48). Cooperation is a joint operation that supports development in relation to the safety of people in a given place.

Comprehensiveness It is the ability to solve most of the problems of the population served. With regard to this principle, we can explain that the security policies designed by the State have a comprehensive objective, addressing with commitment the insecurity that manifests itself in its different forms such as violence, crime, risks and threats that occur in society and disturb citizen coexistence.

IMPORTANCE OF SAFETY

The cardinal objective of citizen security is for the State to guarantee the full enjoyment of the basic rights of the inhabitants of a country, in particular, of those who consent to the development and protection of their personal integrity, their civic rights and the enjoyment of their property. Its purpose is to help guarantee peace, reduce crime and delinquency at the national level through a correct policy of multisectoral prevention and the control of violence that allow people to carry out their activities free of insecurities and threats.

Security and its materialization are related to an increasingly rigid socio-political framework and context, where terms such as State, democracy and governance are of singular quality. We can reveal that the internal security of the inhabitants is essential for the development of a country's

productive activities so that our community can have citizen guarantees in relation to security and protection.

The National Police is the institution in Ecuador that is the constitutional guarantor of citizen security, the control of public order, the protection of rights, citizen guarantees and the security of persons in Ecuadorian territory; for this reason, the Strategic Plan of the Armed Forces 2021-2025 is currently underway, the same one that allows for a strategic coalition between the Armed Forces and the National Police.

INSTITUTIONAL OBJECTIVES

The main objectives of security and coexistence are achieved through the implementation of operations of social and situational prevention, control and institutional development, which together constitute a system based on the foundations of the will of the Social Rule of Law, inter-institutional cooperation and citizen co-responsibility.

These actions are actively joined by information and communication technologies that organise data on violence, facilitate its interpretation and interact with society according to their specific benefit.

The specific objectives are:

a) To increase the effectiveness of the institutions that guarantee citizen security.
b) To increase the level of local, national, regional and international integration; and
c) Strengthen parish, cantonal and community responsibility.

INSTITUTIONS RESPONSIBLE FOR CITIZEN SECURITY

Institutions related to citizen security (FLACSO, 2008): At the national level;

- Ministry of Government and Police
- Ministry of National Defense
- Office of the Attorney General of the State
- State Attorney General's Office
- Office of the Ombudsman of Ecuador

Citizen Security Operational Forces

- National Police of Ecuador
- Joint Command of the Armed Forces

THE CONSTITUTION OF THE REPUBLIC PROVIDES, INTER ALIA,

Article 158.- The Armed Forces and the National Police are institutions for the protection of the rights, freedoms, and guarantees of citizens.

Internal protection and the maintenance of public order are exclusive functions of the State and the responsibility of the National Police.

The servants of the Armed Forces and the National Police shall be trained under the foundations of democracy and human rights, and shall respect the dignity and rights of persons without any discrimination and with unrestricted adherence to the legal system.

Article 159.- The Armed Forces and the National Police shall be obedient and non-deliberative, and shall fulfill their mission in strict subjection to the civil power and the Constitution.

The authorities of the Armed Forces and the National Police shall be responsible for the orders they issue.

THE LAW ON PUBLIC SECURITY AND THE STATE (2019) TELLS US:

Article 5.- Of the public security system and of the State. - The agencies and institutions responsible for the Public Security System and the State are subject to the control of the higher bodies of the functions of the State, legislative, judicial and Social Control and Transparency.

ORGANIC CODE OF TERRITORIAL ORGANIZATION, AUTONOMY AND DECENTRALIZATION

According to Article 41 of the Organic Code of Territorial Organization, Autonomy and Decentralization, the functions of the provincial decentralized autonomous government are the following: ... j) To coordinate with the National Police, society and other agencies, matters related to citizen security, within the scope of its competences... (COOTAD).

According to Article 54 of the Organic Code of Territorial Organization, Autonomy and Decentralization; The functions of the municipal decentralized autonomous government are the following:... (n) To create and coordinate municipal citizen security councils, with the participation of the National Police, the community and other bodies related to security, which shall formulate and implement local policies, plans and evaluation of results on prevention, protection, security and citizen coexistence. (COOTAD).

IMPLEMENTATION OF INSTITUTIONAL SECURITY

In order to implement the Comprehensive Security Manual for the Ecuadorian Public Sector, it is essential to have the commitment of government institutions and their community, to meet the great challenges for peace and citizen coexistence.

Citizen Security is the right of citizens to live in peace, without fear of being a victim of any type of robbery, assault, physical, material or psychological violence. This right is guaranteed in our Constitution (Ministry of the Interior, 2014, p. 13).

Security has become a necessity of society in general due to the high levels of violence and criminality that are observed, which promotes the scarcity of seeking and implementing all kinds of prevention measures, with the vital protagonists being the properly planned National Police.

In addition, those constitutional legal frameworks must be complied with to implement (Ministry of Government, 2019). Consolidating a safe and peaceful society is the constant challenge for the entire public sector. Recognize citizen security as a public good that demands the development of a project as a product of the joint effort of all actors in society.

The involvement, active participation and commitment of all will allow us to make viable the consummation of plans, programs and projects of community development, for citizen security that will allow us to have a safe labor corporation in the future.

INDIVIDUAL PROTECTION

PREFACE

From our earliest days, human beings have distinguished themselves by instituting self-care, from the physical to the intellectual, and to the extent of their knowledge and capacity it is undeniable that they have achieved it; in the same way, in the field of organized crime prevention we have to start with ourselves so that later, within the strategic unification of the Police, authorities and entity, specialized teams intervene for the advice and implementation of plans and actions of comprehensive institutional security.

For this reason, we must understand that individual protection is the set of actions aimed at the security and maintenance of well-being, so that Public Servants must take the necessary measures to avoid the generation of insecurities, as well as to expose themselves to them. It consists of the protection of a basic core of rights; including the right to life, respect for the physical and material integrity of the person, and their right to have a dignified life.

Individual protection has an important objective aimed mainly at preventing any risk situation, whether robberies, assaults and organized violence; All this makes us reflect on how important safety is in a work coexistence. So the importance of individual protection lies in knowing what to do and what actions we can take to avoid dangerous scenarios or in turn how to proceed when we find ourselves in a situation of these and what measures we could take to avoid being victims of the commission of a crime.

For the administration of this set of moderate actions, we want to commit the National Police of Ecuador which is always willing to provide advice to public sector institutions through citizen training processes, and in a short time a virtual application for the cell phones of our Public Servants will come into force. in order to strengthen protection in favor of individuals and collective security, preventing situations of danger or emergency that may pose a risk to public servants installed in

public institutions, it also seeks the organization of human talent trained in issues of prevention in citizen security and of certain specific equipment, resources and materials, as the case may be and how certain criminal actors affect central aspects with respect to the quality of life, among which we find the following:

- Consider safety measures in work and daily activities.
- Take security measures for individual protection so as not to be victims of crimes.
- Consider that there is no absolute protection, there will be moments of vulnerability, so we must be aware of what individual and institutional protection implies in order to apply it.
- Be aware of the appropriate places where you can safely go to be victims of a crime.

What is sought through individual protection is that citizens can responsibly take the necessary prevention measures to avoid the generation of criminal risks, as well as expose themselves to them.

Once we are clear about this issue, we will know that the above greatly helps us to protect ourselves from being a victim of alleged lawbreakers. In fact, there are factors that minimize a criminal act and we can take as examples, a robbery of a commercial premises, on public transport buses, banks, where certain tips can be put into practice that should be chosen for its implementation.

- Ensure that there is lighting inside and outside the Institution, your home, even when it is closed.
- Manage alarm installations and, if possible, video cameras.
- Install protections or security measures for valuables or documents.
- Coordinate with security entities (National Police) in the event of a robbery so that they can provide immediate attention.

Distrust is the imponderable way to deal with the insecurity that afflicts us Ecuadorians, and it is necessary to act proactively, that is, anticipating events that may occur in any context.

Although risk is an integral component of the natural system and of every human event, it is in the hands of the individuals themselves, to prevent fatal outcomes, neutralize their behavior or minimize their impacts.

Individual protection should be a satisfied habit in our society, we cannot be unaware citizens and let everything be taken care of by the National Police, it must work together between the Entity in charge of Security and on a par with the Institution.

If we can avoid being part of crime statistics, we would admit that our society is a fortress in the awareness of individual protection, in the same way we can avoid being easy victims for criminals if we do not give them the opportunity to participate.

It is true that we have the right to travel without a perception of fear, but if we can avoid a criminal act it would be a great benefit for oneself, for one's neighbor, therefore, for a peaceful coexistence where we all undoubtedly win.

CONCEPTS OF INDIVIDUAL PROTECTION

Personal protection is a series of discreet operations and measures aimed at preventing and monitoring dangers to people and property. It is the best dynamic for strengthening prevention and work measures in the face of possible interventions in emergencies, risks, complications and insecurities.

Individual protection institutes prevention regulations to neutralize intimidation and control threats, risks to people and property, consequently implies an adequate response to possible emergency situations present in our society and in the public sector.

The real increase in criminal acts causes manifest changes in the behavior of the populations for the generation of security projects, the first strategy for this is individual and collective protection. It is a series of operations channeled to defense, executed by oneself, for oneself.

People must take the necessary measures to dissuade the generation of insecurities, as well as show themselves to them. They are a succession of protection measures and other preventive actions in the event of an environment of criminal and emergency acts.

It is a complete study from the point of view of security, of the facilities, circumscribing the activities, prevention and protection facilities, as well as the organization of human and material talents and where the actions that the occupants of a building must carry out at the time an emergency situation arises are put in writing.

Individual protection is understood as the set of procedures and measures focused on preventing and controlling risks to people and property, is to provide an adequate response to possible emergency situations and to guarantee the unification, standardization of these actions with the public civil protection system. These actions and measures must be adopted by the holders of the positions, with their own means and resources within their scope of competence, considering three types of protection, which are:

Personal Protection. - It is that quality of being aware of our own protection. Personal self-protection can also be called the way to act appropriately in the face of a risk or reducing the effects of it that are found towards the particular person. You should feel safe both physically and psychologically.

Citizen protection. - They constitute the actions and procedures adopted by the Public Servant or citizen, conducive to preventing threats to people and property. It is the optimal strategy for prevention and action in the face of community insecurity.

Corporate protection. – If it occurs, minimize the consequences. A good Personal Protection Plan is one that, in addition to being well designed, is in accordance with institutional needs, is well maintained and implemented. If one of these three premises fails, we will not be able to guarantee effective intervention and evacuation of occupants in scenarios of insecurity.

PERSONAL SAFEGUARDING COMPONENTS

When faced with a risk, you should consider self-protection resources.

Offender. It is the natural person who performs actions or omissions typified as contraventions in the laws. When the person at risk is predictable; that is, he always behaves in the same way, the aggressor can easily define on what day, time and place he can proceed to attack.

According to León (2012): "It will always be easier to attack than to defend oneself, which is why today we propose a series of rules to minimize the possibility of falling into the hands of crime and being victims of possible robberies, assaults with knives and other threats to which they may be exposed." Here are examples:

- Do not always arrive home by the same route, change daily and remember that the longest route may be the safest.
- Avoid always making withdrawals of money at the same ATM, whether it is the closest to the office or your home, change the passwords periodically and try not to make withdrawals of large sums of money; however, if it is unavoidable to do so, remember that the Police provide the escort service at no cost.
- If you are going to take a taxi, avoid doing it on the street, do not despair and look for a safe means to get it, even if it is more expensive. Don't take unnecessary risks, think that your loved ones prefer you to take a little longer, but that you arrive safely.
- When you go to 'farrear', have a chosen driver or ensure their pick-up, improvisation when going home will make them easy prey for malicious people.
- When traveling in buses, do not have objects such as cell phones or wallets in the back pockets of your pants and if you carry suitcases, place them in the front to avoid being victims of theft.
- It will never be a good idea to walk down the street under the influence of alcohol, do not talk on the street on your cell phone and much less chat, leave that for safe and closed places.
- Be cautious with the personal information you publish on social networks, photos of your home, home address, contact telephone numbers, passwords, passwords and other data, which can be used to help the criminal know your routines and the places you are used to.

CHARACTERISTICS OF PERSONAL PROTECTION

Citizen security seeks to ensure that community life takes place in an environment of solidarity, harmony, prosperity and respect for human dignity. Total security does not exist, it is a utopia to think at all, there will always be crimes; Crime is inherent to the human condition. We can say that it is also cyclical, but it depends a lot on whether the habitual criminals are in prison or on the street. They have the function of minimizing the risks to which the Public Server is exposed.

Many problems and many thefts are due to the fact that the vast majority of these common criminals are consumers of controlled substances (drugs). Risk can be minimized, not eliminated; An important sign in any prevention situation is common sense that will allow us to mark the limits between risk and prudence.

Accepting the innate risk of any action should lead us to guide our decisions based on the fact that any lack of effectiveness of the prevention, detection and treatment system can cause serious consequences.

Information. Aggression can arise at the least expected moment; Therefore, we must always be alert, any action taken to prevent crime and combat crime would not be successful if it did not have the participation of the citizenry, which is why the formulation of our proposal and the implementation of actions must be established with the participation of the institutional community. Whoever handles the information, controls the risk. If the person who may be affected prevents the aggressor from obtaining information, it will hinder his action and reduce his chances of success.

THE SECURITY SYSTEM

It is a set of elements installed and interconnected with each other that warn, detect or act in the event of attempted robberies or other events or emergencies. That is, it is the set of means to maintain a safe state to prevent, detect and eliminate threats to life. A single entity does not guarantee security. The combination of the different resources available makes the protection and protection strategy strong.

ALTERNATE SECURITY PLAN

The purpose of every plan is to raise awareness of the situation that each person may face and how to respond to it in a creative and innovative way. The alternative plan is a proactive strategy that will help address negative changing situations and guarantee the continuity of subsistence in society. That is, having different possibilities of action in the face of certain events so that the person at risk is less predictable and can make changes in situations of suspicion.

COMBINATION OF ELEMENTS

The person at risk must always be creative in search of the necessary resources to guarantee safety because the aggressor changes his ways of acting. Therefore, the person at risk must also change their protection and assistance strategy. Easily visible mechanisms, such as wire fences and others that are difficult to detect, should be used, especially the use of anti-observation measures. In this way, deterrence is accompanied by surprise.

IMPORTANCE OF PERSONAL PROTECTION

The essential objective of personal protection is for the State to guarantee the full enjoyment of the fundamental rights of citizens and the enjoyment of their property. Public safety is a key factor for economic development. It is to prevent and control possible risks to people and material goods and to be able to provide solutions.

To deter the emergence of a crime, it is necessary to identify and address the causes related to its commission, but, above all, it is necessary to know how to neutralize its effects and transmit confidence to the public. Personal protection is vital to have peace of mind to carry out our activity without fearing any scares or dangers. And, above all, because of the awareness that some outcomes could have been prevented.

The social prevention of crime, in addition to publicizing measures to avoid victimization, sensitizes, informs and strengthens among citizens the application of self-care measures. The prevention of addictions is a strategic issue for public safety, as is the development of strengths in the individual to overcome conditions of adversity or danger.

Citizens must take the necessary measures to avoid the generation of risks, as well as expose themselves to them. Once an emergency has occurred, they must conduct themselves in accordance with the instructions of the competent public service agents.

Therefore, in order to prevent crime, it is necessary to understand what factors generate it and design prevention strategies based on the analysis of scenarios that minimize its effects (Leal, 2018). Its purpose is to be able to take immediate action against any risk; In other words, self-protection will help to minimise risks quickly and effectively. In addition, it will be possible to reduce economic losses, since operating correctly avoids personal and/or material damage (Leal, 2018).

Personal protection is vital to have peace of mind to carry out our activity without fearing any scares or dangers. And, above all, because of the awareness that some outcomes could have been prevented.

Without a doubt, the most important particularity of being able to know and apply self-protection actions will always be to be able to safeguard our lives. (Leal, 2018) With this background, it is imperative to make a deep reflection on applying and stimulating safe places with

entities of the State, community and especially the Police in order to reduce risks and improve our human and productive capacities.

PERSONAL PROTECTION MEASURES

These are techniques that aim to protect the public servant against external attacks. What is personal protection? It is the set of actions aimed at protection carried out by oneself, or for oneself. Citizens must take the necessary measures to avoid the generation of risks, as well as expose themselves to them. Once an emergency has occurred, they must act in accordance with the instructions of the competent public service officials.

If you did not have the opportunity to know and apply the basic rules of prevention to avoid being a victim of crime, today we put for your consideration some rules that will allow you to know what must be done to avoid criminal stalking and commit you so that, consciously, you decide not only to know these rules, but to accept them and exercise them for your own well-being.

Some of the measures that will help us avoid being victims of criminal activity are the following:

- Avoid becoming a victim of a criminal act, taking into account the environment in which it may occur.
- Contact with strangers on the street must be avoided, even more so if you are alone.
- When at an ATM, avoid asking for help from unknown people.
- Be aware that this criminal act can take place at any time and in any place.
- Avoid using electronic devices when moving down the street as this attracts the attention of criminals.
- Use moderate, zipperable bags and use your wallet in the front pockets.
- Try to use ATMs in crowded places and during busy hours.
- When you leave somewhere, do it accompanied by another person, and if it is in a group, even better.
- Do not walk in dark or abandoned places, avoid walking in the same direction as vehicles, it is better to walk against the road to look at those coming and not expose yourself to an attack from behind.
- Find a place to take shelter, a place with many people, security guards or police.
- If you think you are in danger, do not be ashamed to scream. Consider bringing a whistle or something that makes noise.
- Always carry a telephone number for emergencies and that it is activated by pressing any key.

• If you think you are being hunted, walk quickly to the first illuminated and commercial area with people. If it is a vehicle, turn and walk in the opposite direction.

Most human beings by nature, seek an environment of peace and tranquility to develop our daily activities; More than contradictory, it is to say that many people with their actions create an environment of insecurity, anxiety and even danger to their own integrity.

Thus, self-security and self-protection depend on the responsibility and behavior we adopt as a society to minimize risks and vulnerabilities. When we talk about self-protection, we refer to the prevention and control of risks, as well as the actions and measures that must be adopted in order to guarantee the protection of citizens, property and the environment, for which we recommend to the public sector workforce the main prevention actions.

Measurements

Presence of Criminals

Most people by nature seek to have an environment where they can carry out their daily activities in a serene way, however, this constant tranquility means that they do not care about their own integrity, and for this certain fundamental criteria of individual protection measures must be kept in mind:

Procedure

• Nothing is guaranteed when it comes to safety, you should always have several prevention measures.

• Always be attentive and avoid a "proximity" of people who have a certain negative and suspicious attitude.

• Do not always go the same route after daily activities and always try to be accompanied.

• Always walk in the opposite direction to the direction of vehicles to avoid being chased and be aware of everything around you.

• If a person is suspected of looking for places where they can take shelter such as premises with several people or with private security, if they do not have any of these, they can change address always maintaining a distance of more than ten meters between you and the suspicious person.

• If you see a person approaching in a suspicious way, run and observe the reaction of that person, many times they will not chase you because they do not want to draw attention to what is happening.

• In case you have already been approached by a criminal, do not run, this could endanger your integrity, since it is unknown how that person could react.

• If you can scream do not ask for help, this will make the people around you afraid and move away, preferably shout "FIRE!", this will attract people's attention and they could even approach out of simple curiosity.

• Another option is to shout the name of a person and greet indistinctly people around you who can help you, this could help the offender to renounce the commission of the criminal act.

• If you have a feeling, never rule out that possibility, it is better to be safe than sorry. Do not provoke situations where the offender feels that he is losing control of the situation, do not try to confront him, since most are always accompanied or could carry firearms or sharp sharps.

Public means of transport are also widely used by criminals during rush hour, as they can hide among people and when acting in a group deliver what was stolen to another person in the event of being apprehended and have nothing in their possession.

There are two methods widely used by criminals to act on public transport or bus stops, one of which is the so-called "arranchador" who takes advantage of a person's carelessness to steal his cell phone or in the case of women to rip off his earrings, and on the other hand, the so-called "misleader" who, taking advantage of his partner, diverts the victim's attention to take suitcases. boxes or things that people have left on the floor or do not have in sight; To avoid this type of situation, you must always be alert and take certain recommendations such as:

• If you are going to use your cell phone on the street, always be aware of the people around you or if one of them pays a lot of attention to you.

• As far as possible, avoid going out on the street with jewelry, as this attracts the attention of criminals.

• If a person approaches you to ask for help with an address or offer to sell you an item, do not neglect your belongings or avoid talking to that person.

• If you are on public transport and it is full, try to carry your suitcase or bag in the front, this will prevent them from opening or cutting it to steal your belongings.

• Try to carry your wallet in the front pocket or inside a jacket or jacket, never in the back pocket of your pants, also try to always have your belongings where you can see them.

Reiterating the above, if you are going to talk on a cell phone in the street, it is preferable to enter a place or do it in a place where there are more people and never lose attention from your surroundings, this is essential to avoid any possible theft (General Secretariat of Security and Governance, 2010).

Home Security

Home security is aimed at protecting the place where we live, our families, valuable objects that are most affected because it is where we develop the most private part of our lives and where we need to feel a greater sense of security and protection.

When we talk about security, we must know that the offender acts where it is easier to do so to avoid being discovered. Therefore, safety begins with prevention and taking reliable measures to protect what matters most, our lives.

Procedure

- If you are temporarily absent from your home or apartment, notify the Community Police Unit of your sector of your departure, so that it can permanently register and monitor your home.
- The main entrances to your home must have security and protection devices.
- Have an intercom at your front door to identify people.
- For safety, notify a close family member or trusted neighbor of your temporary supervision.
- Install a good home alarm system and internal lighting.
- Do not allow public service workers to enter without their prior request. If in doubt, urgently contact the police in your sector.
- If you consider any type of confirmed inspection, ask for their identification.
- In the event of the temporary absence of parents due to work situation, it is important that people who are in the home maintain permanent communication with their relatives.
- Have the emergency number (911) in a visible place.
- Due to an emergency, your call must be immediate to ECU 911

Exit Security

Currently the community feels uneasy and threatened by the different ways in which crime or organized groups act, especially when people leave their homes either on foot or in a vehicle, because they are considered propitious places and easy targets, so it is important that before their decision to leave their home, Take into account certain recommendations that will protect your life and that of your families.

Procedure

• As mentioned above, if you are temporarily absent from your home or apartment, notify the Community Police Unit of your sector of your departure, so that they can provide security and permanent surveillance at your home.

• Make sure the lock, alarm and internal lighting system is activated.

• When you decide to leave your property, it is necessary that you observe the surroundings of your street from a safe place, in order to identify any abnormality with strange people and vehicles.

• Before departure, it is important to observe possible suspects in their surroundings, whether they are on foot, on a motorcycle or in a vehicle.

• If you have any suspicion or news, call ECU 911 urgently and ask for emergency help.

Home burglary

It is a crime that a person incurs when seizing other people's belongings in a house or apartment. These robberies occur in places and times where the population has a low economic situation, due to the increase in unemployment, since they do it as a last resort to satisfy their basic needs.

It is essential to show that due to the fear that the affected people feel they do not report this type of crime, it is worth mentioning that there are two ways in which home robberies can occur: Without violence, this usually happens when families are not at home for some reason and criminals take advantage of the situation. With violence, it usually happens when the family is inside the home and they receive threats, physical aggressions from criminals, so it is necessary to know what protection measures are of vital importance for the knowledge of the public helping to combat this problem that occurs on a national scale, in any place and at any time.

Procedure

• Remember that your peace of mind and that of your family depends on what you and your family say, do, or don't do.

• Manage an environment of trust that allows you to know the whereabouts and activities of your family at all times.

• Encourage mutual concern about safety issues so that everyone participates in this effort.

• Insist to your family on the importance of observing and improving safety measures.

• Establish a personal "code" of intra-family communication for emergencies.

• Preventing strangers from entering the home, such as enumerators, workers of public service companies and/or security entities, without first establishing their full identity.

• Requests the support of the National Police to know the background of security agents assigned to the area and security guards.

• If your keys are lost or stolen, immediately change the locks on your home.

• Keep the door closed when leaving or being inside it, if possible you should change the locks periodically or install a peephole to verify who is knocking on the door.

• You should never think of leaving the keys to the house hidden outside the house.

• Do not post on social networks or give any information about the outing activities carried out by your family.

• Plan community talks with the help of the National Police to provide information in case of danger that may be generated in a home in order to maintain optimal, stable and safe crime prevention.

• Take into account emergency telephone numbers so that security entities provide us with greater security when reporting any theft.

• In case of suffering any physical or emotional damage, go to the nearest institution or health center, and then inform the relevant authorities of what happened and make the respective report. (Puentes, 2020).

• Create WhatsApp security groups among the neighbors of the community so that they remain informed of any suspicious movement that may occur in their neighborhood. (Puentes, 2020).

In order to prevent home burglaries, the National Police recommends the following actions:

Procedure:

• Know the location of the Community Police Unit closest to your home.

• Memorize emergency numbers with your family.

• Observe the neighborhood environment, if you observe anything suspicious call 911.

• Carry out a brief analysis of the vulnerabilities and threats presented by the infrastructure of your home to reinforce and strengthen them and thus avoid taking unnecessary risks.

• Do not allow strangers to enter or leave the door open for someone who is arriving as you leave.

• Do not provide the information or data of your family members to strangers, preferably by telephone.

• Store your valuables in a safe place.

• Install a good outdoor lighting system, which can be controlled from inside the property.

• Vary your times of entry and exit from the home to avoid possible assaults and kidnappings.

Express Kidnapping

In society, these actions of illegality occur that deprive the freedom of the human being with economic, social and political objectives, for the rescue of a victim leaving serious psychological consequences of fear, fear and anguish; therefore, the participation and intervention of our society is needed, adopting a series of preventive procedures to avoid being victims of this crime.

Taking as a reference the current regulations of the COIP where it is stated that kidnapping refers to an act where: "The person who deprives of liberty, retains, hides, snatches or transfers to a different place one or more persons against their will" (COIP-Art.161).

On the other hand, the United Nations Anti-Kidnapping Manual mentions that the prevention of kidnapping must be a priority activity of all governments both within the national boundary and also outside it, so it must be ensured that appropriate measures are taken through a study and preparation to prevent it.

Procedure

• Have a personal conscience regarding personal safety.

• Avoid going to spaces declared at risk and dangerous.

• Avoid posting photographs and personal information on social networks.

• Avoid transporting large amounts of money.

• It is prudent to change the entry and exit times to our activities.

• Always protect your financial information, don't share it for security.

• Stay alert when getting out of your vehicle, avoid being ostentatious.

• If you are inside a vehicle, maintain safety devices.

• In public places, avoid making comments on personal and economic matters.

• It is feasible to develop a personal and family emergency plan.

• Do not go on dates with strangers in uncrowded or distant places.

• If you suspect that you are being pursued, you should look for alternative routes of travel.

• In the event of an emergency, go urgently to the nearest Community Police Unit.

• If you receive a kidnapping threat or are contacted by phone by the criminal, report it to ECU 911.

• You should avoid making threats or commitments to criminals.

Robberies on Public Transport

The statistic is alarming, as it reveals the non-existent security strategy at the national level, which is why crimes such as robbery of public transport users is on the rise since people who commit crimes on public transport consider that it is easier for such action not to have negative repercussions for them. Since multiple times during robberies of users, people observe the event but for fear of being attacked they do not react and do not help the victim, or they also take advantage of the fact that many users for economic reasons decide to take the service of illegal transport vehicles to get around, in this virtue we provide the following security recommendations to avoid theft in public transport.

Nowadays, the community frequently uses public transport as a very effective means of getting to all places, but due to the various risk situations that occur in it, it has caused users to feel constant fear from the moment they use the service, since they do not have the confidence that there is a system that protects them optimally and that guarantees that it does not happen to them nothing, because daily there are events where unfortunately many people see their personal integrity affected by the theft of electronic equipment and money; in other cases they are even attacked or may lose their lives if they resist these adverse situations.

Procedure

• Always try to change the route of travel, this reduces the possibility of being assaulted, since on many occasions criminals follow you and identify your movements.
• Avoid boarding buses with excess passengers and in desolate places.
• Do not carry flashy or luxury items, such as jewelry, clothing, cell phones, laptops.
• If you are going to notify the driver or assistant of a robbery, you must do so with absolute discretion.
• Only use stops that are safe to board or get off where people or businesses are always open.
• Avoid falling asleep on public transport, always stay alert for the presence of suspects.
• If you are the victim of an assault, never offer resistance, only memorize as many characteristics of the aggressors as possible and provide this urgent information to the National Police.
• When getting off any type of public transport, discreetly observe your surroundings to check that no one is following you, if you detect tracking, find a safe shelter and call ECU-911.

• Place your backpack on your chest and protect it with one arm because suspects operate in a variety of ways.

• Not traveling in the last seats turns out to be spaces and more vulnerable to theft.

• If they are vehicles of the Eco Via, Metro, Trolleybus or the different corridors, do not travel near the doors.

Criminal groups usually locate themselves in these areas to flee easily after the theft.

• When choosing a public service, make sure it is from an authorized cooperative to minimize the risk of suffering some type of assault, robbery, theft, or injury.

Transfer and Return of Activities

During the fulfillment of our daily activities outside our home, professional and work activity, it is important to always be attentive and alert, observing everything that happens on our journey, since crime is right in the environment of the community, only then will we reach levels of prevention and personal safety, so the following measures are recommended.

Procedure

Always be alert: If you are on the street, avoid being distracted and always carry your purse and personal valuables forward, tightly closed and holding it with your arms, "the opportunity or opportunity makes the thief" Report strange movements: When you see unknown people prowling and observing in a strange way, immediately notify ECU-911. A record can prevent future thefts. (Durán, 2017).

Do not give personal information: That is, do not provide personal or family data through surveyors, phone calls or contests, among others. Do not post information on social networks about the geographical location, new acquisitions, real estate or vehicles. (Durán, 2017).

An always connected community: It is very important that public servants meet and talk about the doubts and fears that haunt them. Together you can create anti-theft prevention campaigns by making a WhatsApp group.

Exhaust all resources: A great idea is to install security cameras and alarms in homes or places. Place signs outside that say "We are watching you", to scare away criminals. (Third, 2016).

Ability to react in case of a situation of vulnerability: If you are a victim, do not act in desperation in the face of attackers. Your peace of mind will guarantee your care and that of others, take care of your integral safety. (Third, 2016).

Maintain levels of alert: If you or your relatives want to move money in large amounts, ask the National Police for help so as not to be the victim of a crime.

Choose a safe vehicle: If you know that you leave work late, look for a safe means of transportation, or if you walk try to leave with at least more people, and if you are able to do your transfer in a taxi that is safe.

DIALOGUE BETWEEN PUBLIC SERVANTS, POLICE PERSONNEL AND LOCAL GOVERNMENT

To encourage permanent dialogue between civil servants/police and the local government on security issues. Strengthening prevention initiatives: All public servants must be trained to prevent different criminal acts, as well as to avoid traveling through places with a crime rate or areas identified as insecure.

Avoid walking alone: Public servants or citizens should walk in groups through dangerous areas, avoid walking alone late at night, in the best cases go out in a vehicle from the door of the institution to their home.

Do not encourage the criminal: Public servants should not take their electronic devices out where there are unknown people or people who are drinking in the streets, in desolate places because if a criminal sees it he would take advantage of that opportunity to attack him. (POLJUVE, 2009).

Be aware of the protection of physical well-being: It is necessary to avoid confrontation, as far as possible try to evaluate the possibilities without exposing yourself to greater dangers. (Third, 2016).

Observe: When leaving your home or returning to it, observe the street in order to identify strange people or situations that endanger your integrity and safety. (Third, 2016).

Take small precautions, which reduce the chances of an assault: It is recommended that computers or laptops are not in plain sight inside a vehicle. Steering wheel locks and alarms are deterrents when it comes to a robbery. (Third, 2016).

Neighborhood organization: It is very important that citizens/public servants integrate, know each other and have each other's contact information.

Neighborhood organization must be simple and effective. (POLJUVE, 2009) Keep in mind the places of risk and the most common times and days for crime: Crimes present strong patterns and concentrations in time and place.

Educate: Crime prevention is everyone's task. It is recommended to talk about these issues and recommendations as a family, analyze the routes and behaviors in order to establish protection protocols within the family. (Education, 2017).

The offender makes a study of the times and days that are feasible for the commission of his acts, therefore, the places with the highest risk or known as red zones should be avoided.

VEHICLE THEFT AND ASSAULT

This problem is of a social nature since we are all harmed, either directly or indirectly, since in situations such as the simple fact of waiting for the traffic light to turn green, in the vehicle it can be dangerous, since during the transition time of the colors of the traffic light we can be victims of theft.

This type of situation means that people cannot have peace of mind when traveling in their own vehicle, but they also cannot be calm when the vehicle is parked, either for a long time or for a relatively short moment, since it should be noted that the vehicle is the focus of crime as can be seen in various statistics. where mainly what happens is that the vehicle can be stolen and later disassembled to sell its parts illegally at substantially low costs, so that it is a very lucrative business or also to sell it as a second-hand vehicle, with the modifications of the case.

At this point we can point out that routine is the main enemy, since when the person at risk is predictable; that is, that he always behaves in the same way, the aggressor can easily define on which day, time and place to attack since he usually passes through the same place every day; On the other hand, we can reaffirm that absolute security does not exist since irrigation can be minimized but not eliminated. We can also say that the security system is like a chain, since a single entity does not guarantee its effectiveness, since the combination of the different resources available makes the protection strategy strong.

Finally, we must always maintain an alternative security plan, which means that we must have different possibilities of action in certain events so that the person at risk is less predictable and can make changes in situations of suspicion of a robbery or assault.

THERE ARE FIVE BASIC RULES THAT CAN ELIMINATE OR REDUCE CRIMINAL ACTION

Rules

Observation. - It is the action of observing or looking at something or someone with great attention 360° carefully to acquire some knowledge about their behavior or characteristics, controlling everything that is within sight of them. Always look at the suspect's hands.

Distrust. - Doubt people, unfamiliar environments, situations and objects, without falling into paranoia.

Proactivity. - Anticipating events, this means taking control and making things happen, instead of just waiting for an event to happen and put us at risk. Albert Einstein once said that "life is very dangerous; not for those who do evil, but for those who sit and watch what happens"

Common sense. - It is the faculty of orienting oneself in what most people would do, if common sense says run or scream, that is how it should be done.

Feedback. - It is the use of modus operandi, we must learn from events that occurred to family members or other people. As self-protection measures to avoid being a victim of theft of your vehicle, the following should be taken into account:

Procedure

Prefer public parking lots. Look around before parking. Plan your arrival and departure times as a busy place during the day can be deserted and dark at night.

If you distrust something or someone, pass by and evaluate the situation.

Try to keep the windows closed while you are walking. If you have any doubts, call the police.

Always remove the ignition or activation key from the vehicle.

Do not leave your house keys inside the vehicle.

Never stay inside the parked vehicle because that makes you a perfect victim.

Do not leave any valuables in sight inside the vehicle.

If upon returning to the vehicle you notice a malfunction that prevents you from moving it, call a mechanic immediately as someone may have caused the failure.

URBAN TRAVEL

Let us remember that we continuously have to carry out various activities in the neighborhood or citadel where we live and due to the conditions of our society we are exposed to vulnerabilities and threats that cause fear and affect our integrity, for which we must adopt actions to minimize risks and violence.

Procedure

When walking down the street, avoid contact with strangers, even more so if you are alone. When you leave somewhere, do so accompanied by another person or in a group. Do not walk through dark or abandoned places, avoid walking in the same direction as the vehicles, it is better to walk against the road to look at those that are coming and not expose yourself to an attack from behind.

When crossing the street, if you observe the behavior of a suspect; and if the suspect crosses, do not allow him to "close the space" or apprehend him. Always observe everything that is happening around you.

Analyze the behavior of those who might be suspicious, such as hands (usually in pockets) and eyes.

Look for a place to take shelter, a place with many people, security guards or police. If you need help on the street, you should shout "help, fire" so that people pay attention to you and this will help them to notify a police officer. Women and the elderly are a perfect target for criminal action.

After making purchases, do not check your money outside the commercial premises, or inside your vehicle. Carry the strap purses over your shoulder, with the flap next to your body, and keep your hand on the strap. "Stay alert even on public transport, "always carry the exact money on hand before getting on the bus.

When traveling on the bus, hold your keys and other valuable items well, at night, keep your purse or wallet in the front of your body. If someone disturbs you on the bus or you feel uncomfortable when possible, sit by the aisle in an emergency.

Try not to stand by doors; Try to take a taxi that is moving.

RURAL DISPLACEMENT

It is called the longest travel time from a starting point to an end point, through the use of different means of transport that are generally carried out outside the urban perimeter, from one city to another.

Procedure

The following relevant measures are of great relevance to persons who, collectively or individually, are engaged in internal or international displacement:

- Identify safe departure and transfer routes.
- Keep a phone activated in a central location so that you can be informed and report possible threats.
- Do not travel off main roads at night.
- Try to travel with someone else and avoid doing so at night.
- Refrain from boarding passengers on your journey.
- Remember that any unforeseen action can cause insecurity.
- Remember that in remote and desolate places the risk of people who pass through them increases.
- Frequently inform your family members of your journey and final destination

COMMUNICATIONS SECURITY

One of the frequent problems is scams perpetrated by telephone and emails, causing economic losses; The maneuver of this scam comes from the scammer to seem very friendly; What's more, they even go so far as to address each other by name, chatting a little about what they want to

offer. They may claim to work for a company you trust, or scammers may send correspondence or post ads to try to convince you to call them in order to get their own information from the victim in order to get their money into their money.

Using unknown links can steal information from your user or personal site. In all places, the cell phone is used, since it is currently the most used communication tool by all citizens, and indisputably that the use of this medium in public places is not the most advisable to keep us safe; It is no less true that these mobile devices are very useful since they help us to keep in touch, so it is important to take care of the information we carry on it, especially on social networks, which is where most people upload personal information, their photos and everything that has to do with their family and people around them; therefore, you must take security measures to avoid being a victim of a crime.

Procedure

- When answering your phone, limit yourself to providing your personal data.
- Do not program your answering machine, it may be a tool of the criminal.
- Do not allow surveys of any kind to be conducted.
- Prepare your family and collaborators on the procedure they should adopt in the event of telephone threats.
- Do not provide any information in the event of false calls.
- Limit yourself to providing by telephone location of their families, addresses, names and activities.
- In the face of a threatening call from an explosive device, remain calm, memorize the tone of voice, accent, mode of expression, attitude, noises, sex and apparent age.

Then call Ecu 911 urgently and ask for help.

COMPUTER SECURITY

With the advancement of technology, most threats and risks have moved to the virtual platform. It is the discipline that deals with designing the rules, procedures, methods and techniques applied to achieve a safe and reliable information insertion system; These sites encompass a number of security measures, such as antivirus software programs, firewalls, and other measures that depend on the user, such as enabling and disabling certain software features, such as Java scripts, ActiveX; In this sense, it is necessary to take care of the proper use of the computer and other devices to avoid the publication of personal information on the Internet, especially on social networks and websites that are not trustworthy.

Procedure

- Confidentiality in the emails of the different accounts that are free.
- Limit yourself to sending personal, banking, economic and password information through computer networks.
- Be very careful with SPAM, because of the advertising that is offered to generate scams.

SOCIAL MEDIA

Nowadays, social networks are a fundamental tool for the progress of society, as they facilitate the quality of life of their users, mainly communication between people, regardless of where they are.

At the same time, we must also understand that there are always people who misuse it, making this technological resource become a dangerous weapon in the wrong hands, in which we are all exposed to being victims of countless crimes, such as harassment, cyberbullying, among others.

It is our duty as responsible users to take all security and privacy measures for the information we share. Aware of the great reach of social networks and the easy access to electronic platforms, this fact forces us to recommend certain rules for their use.

Procedure

- When using the Social Media Web Service, observe the instructions for use and privacy.
- Use of strengthened passwords to access default email accounts.
- Do not use your own data to set up your profile.
- Limit yourself to incorporating your profile and photographs in the accesses of different pages and accounts.
- Opt for security of permissions for computer applications.

SECURITY IN BANKING ESTABLISHMENTS

The presence of police in banks is intended to determine the degree of importance of security in these institutions, where the best methods and strategies stand out when using any transaction mechanism so as not to be victims of robberies by common criminals.

Procedure

Take precautions when making large cash withdrawals, use the Police Securities Custody Service Do not make cash deposits and withdrawals, use online services for your transactions If you

observe the presence of suspicious people in the bank's environment, inform the security personnel so that they can take the corresponding actions.

If you notice that you are being followed on your way to the exit of a bank, contact the MI UPC virtual application and ask for support.

When using the ATM, check that it does not have additional devices, traps and cameras. When operating the ATM, do not allow them to view your personal password. Do not allow the help of private individuals when making a deposit or withdrawal. Always compare your card receipt with your statement.

WORK ENVIRONMENT

Every day people are victims of insecurity in their work and productive activity, causing serious consequences that affect the economic aspect and cause a lot of fear. That is why it is necessary to provide advice to our students and their families in this area if we consider that we are harmed daily by organized crime in everything related to our heritage.

Procedures

Ask for the support and advice of the Police so that they can carry out an evaluation or technical study of the security in your work. Consider incorporating closed-circuit video and surveillance security with their respective sensors and alarm. Provision of identification cards or security fingerprint for entry to the interior of the facilities.

Select areas for public use and those restricted for your own safety and that of your support staff. Socialize internal security measures with your staff so that they can adopt them in case of any contingency.

Arrange for all employees at work and visitors to carry identification credentials for their mobilization. Consider a frequent review of the safety devices that count the physical area of your work.

Installation of an internal alarm system, connected to the community alarm system or the Police Unit in your sector. Work together with local authorities and the community seeking to strengthen the security of their sector.

FAMILY ENVIRONMENT

It is essential to create a conducive, healthy and positive environment for our family, generating safe spaces for them, and even more so with the health emergency, it is a priority to strengthen the family unit over preventive care to mitigate risks and violence, so it is essential to put into practice certain actions of self-protection and security.

Procedure

Develop a family awareness of the risks generated by insecurity. Establish a family code to disseminate when in an emergency. To generate effective and permanent communication in the development of our activities. Refrain the family from providing information about your actions. Do not go to dangerous places where the integrity of your family is exposed. Maintain contact with the Police in your sector for surveillance and abnormalities. Have information from emergency and security agencies.

NATIONAL POLICE STRATEGY

This is an application developed by the National Directorate of Information and Communication Technology, based on Milestone 3, which refers to modernization that tells us about incorporating technological tools to citizens; This application is available in the different mobile virtual stores, since the Ecuadorian population is currently in a constant modernization.

In order to achieve an efficient performance in its work towards the community and fulfilling its constitutional and institutional mission of protecting and guaranteeing the rights of people, citizen security and public order, the National Police has developed the mobile application "My UPC".

Approximately 80% of households have access to a mobile device, so that they can have a police force closer to the service of their people.

The "My UPC" Mobile Application is aimed at providing an effective service to citizens and satisfying the different demands of the community, since it contains informative data on police services carried out, as well as the UPC closest to its location, visualizing a route to reach it, accessing a telephone call to the UPC, it also contains information and the possibility of registering three types of alerts: Community Alert, Domestic Violence Alert and Stolen Vehicle Alert, which will be attended by the National Police.

When downloading the application, users must register with the real information requested so that the services offered by the mobile application are provided in the most efficient way possible.

This information collected will be used exclusively for police analysis purposes, complying with the expectations and standards of computer security, in addition to being able to meet the needs of citizens.

The end user's data must be registered within the necessary requirements such as: ID number, surnames and first names, gender (Female, male, or other), email, telephone number in which the application is used; In the case of foreigners, it will be necessary to have the registration of the official document of their country, together with other data.

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Hospital pedagogy and its inclusive view

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Janine Marta Coelho Rodrigues[1] and Myrella Gomes de Moura[2]

ABSTRACT

The discussion about Hospital Pedagogy has been growing in recent years, in view of its visible importance in this alternative learning environment. Thus, this article aims to reflect on the training of the pedagogue to work in the hospital context, considering a little of the history and the Brazilian context, within the current inclusive educational paradigm. With this understanding, it sought in the qualitative research, a bibliographic review on the subject, added to a case study illustrated from an experience with Hospital Pedagogy carried out at the Lauro Wanderley University Hospital, at the Federal University of Paraíba (UFPB). The results showed that, in fact, the university extension project "Psychopedagogical Care for Hospitalized Children and Adolescents: Alternative Work for the Pedagogue" is characterized as an important space for the training of the pedagogue, within an inclusive vision of education. And, although it is not officially part of the internship field for Pedagogy students, it has been fulfilling this function through university extension.

Keywords: Pedagogy, Hospital, Inclusion.

[1] Doctor in education and professor at the Federal University of Paraíba
E-mail: jmcoelho@tg.com.br
[2] Graduated in Pedagogy from the Federal University of Paraíba
E-mail: myrella1999@hotmail.com

INTRODUCTION

The profession of Pedagogue is as old as the educational processes conceived from the most formal point of view. Since ancient Greece, this systematic educational function was assigned to someone in particular, usually a slave or servant, in order to conduct the education of the child who was left in his care. So, since Antiquity, it was already understood that this was a function that required some skill, planning, time, etc. Therefore, it could not be done without dedication to the task. However, it was only in the seventeenth century that Comenius would give Pedagogy its more formal and scientific character (Saviani, 2007).

It is evident that here our objective is not to digress about the history of Pedagogy, because we would need to dedicate ourselves only to this purpose. Our effort is made only to highlight the importance of the profession, regardless of time or context, and to contribute to reflecting on the role of Hospital Pedagogy, still little known and valued in training courses in Brazil.

It is known that from Antiquity to now, a lot has changed and the specialization around the pedagogical function and its social role, too. In this context, the role of the pedagogue is seen from new angles and dimensions. The action of Pedagogy is expanded because the view on education in today's world is also broadened. In the last century, Pedagogy has entered other spaces, such as: company, hospital, prison, NGO, involving the public, private and third sectors. Here, we are interested in reflecting more closely on Hospital Pedagogy and its commitment to the inclusive paradigm.

If, for a while, Pedagogy as a science was circumscribed to the school, today, it is known that this professional reaches more and more space, based on the demands that arise in different environments, where there is a lack of a look at the planning and execution of activities based on the knowledge of education as a science or as art. However, it is still important to deepen the topic, as it is necessary to "demystify the idea that this professional can only work" in school environments, as warned by Silva *et al* (2017, p. 3).

Based on these considerations, we aim in this article to reflect on the training of the Pedagogue to work in the hospital context, considering a little of the history and the Brazilian context, but emphasizing, above all, the paradigm of educational inclusion. Thus, we intend to analyze the experience of the project "Psychopedagogical Care for Hospitalized Children and Adolescents: Alternative Work for the Pedagogue" developed at the Lauro Wanderley University Hospital, a university hospital of UFPB, to deepen if, in fact, it consists of an experience of hospital pedagogy and it is related to the ideals of inclusion.

HOSPITAL PEDAGOGY AND ITS ORIGINS

For Holtz (2006), Pedagogy as a science is focused on the study and application of doctrines and principles that aim at "a program of action in relation to the formation, improvement and stimulation of all people's personality faculties, according to ideals and objectives" previously defined (Holtz, 2006, p. 6). Therefore, the action of the pedagogue is not limited only to schools.

In this sense, it is understood that, as a science, Pedagogy has education as its object of study, as well as its methods and principles – and these are not limited only to school education. Therefore, it is an area of study that focuses on the theories of teaching and learning, whose social and political field takes place in different spheres, and which today are committed to education as a right of all, according to inclusive precepts.

From a global point of view, Oliveira (2013) also considers that Hospital Pedagogy care emerged in the mid-twentieth century in France, more specifically after World War II, when the number of children and adolescents interned increased, for longer periods, due to the sequelae caused by this large-scale conflict. Therefore, Hospital Pedagogy (PH) is born from the need to respond to the real needs of the population. But, not just any group, it turns to the excluded – sick, sequelae.

Thus, for Kochem (2019), the first initiatives in hospitals in France, more specifically in the city of Paris, occurred around 1935, with the installation of the first hospital class in the world. According to the author, the initiative came from *Henri Sellier*, urban planner, politician and former Minister of Health, and can be considered a pioneer in the area of hospital education. Such an initiative, then, was a response to the results of World War II, which left many children and adolescents unable to attend schools – the excluded – with physical and emotional sequelae, and therefore, with the need for long periods of hospitalization. This was, therefore, a driving element of Hospital Pedagogy.

In this regard, Pacco and Gonçalves (2019) consider that at first, it was France that turned its gaze to the inmates, coming from the war. Later, it was Germany and the United States, mainly concerned with the increase in the number of cases of children and adolescents with tuberculosis, since an epidemic of the disease reached this public. Thus, little by little, different nations around the world began to develop actions in this area aimed at those who for different reasons were excluded from the opportunity to study.

In Brazil, the first practices date back to the 50s of the last century, so they are still very early. But, for Oliveira (2013), there may be indications of an even older hospital pedagogy, in Brazil and in other parts of the world, when we consider experiences in hospitals, since the seventeenth century, with children with disabilities, prevented from studying in regular schools. Certainly with a very different character from what we have seen today, we can glimpse a much older origin for hospital care.

MEANINGS OF HOSPITAL PEDAGOGY

It is a fact, therefore, that as a recent area, Hospital Pedagogy still has a lot to develop. But, over the last decades, it has become increasingly recurrent in pedagogical studies, because, being a way of responding to the demands for the inclusion of groups "momentarily" excluded, due to illness and hospitalization, it becomes a clearer part of educational policies. Thus, for those who need to get away from the school environment for a significant time, Hospital Pedagogy fulfills the role of maintaining their bond with the school, with knowledge, with knowledge, eliminating the possible educational distance and damage to development.

In addition, it is necessary to consider that Hospital Pedagogy can also be seen as an important resource to guarantee education for life, for life, as advocated by UNESCO and other international organizations (UNESCO, 2001). On the other hand, Hospital Pedagogy is also a propeller of another way of dealing with the education of those who need curricular adaptations or adaptations, as provided for in the legislation in favor of educational inclusion (Brasil, 1996; Brazil, 2008; Brazil, 2015).

Added to this is the fact that the educational care provided in a hospital is not only focused on pedagogical support, but adds emotional and psychological elements typical of those who are in a condition of illness and suffering, common to the state of hospitalization. Therefore, it is not only the right to education that is being guaranteed, but, above all, to issues of health and well-being, so necessary for childhood and so conflicting in adolescence. Aspects that go far beyond the physical space of the school are observed and respected in Hospital Pedagogy.

HOSPITAL PEDAGOGY AND LEGAL ASPECTS

In order to guarantee the right to hospital care, Brazilian legislation is clear, through our Constitution, the Law of Guidelines and Basis of National Education No. 9,394 (1996), Law No. 13,716 (2018) and other legal provisions. In the Brazilian case, it is notorious the wide range of regulations that defend education as a right of all, therefore, of an inclusive education, where no one can have such a right neglected. In this sense, the Federal Constitution (1988) highlights in its Article 205:

> Education, a right of all and a duty of the State and of the family, will be promoted and encouraged with the collaboration of society, aiming at the full development of the person, his preparation for the exercise of citizenship and his qualification for work (Brasil, 1988, Art. 205).

Based on what the aforementioned article defends, it is possible to understand that if education is a right of every citizen, it is, therefore, a student's right when he is in a condition of illness and hospitalization, and such enjoyment cannot be suppressed, nor can its impossibility of

access be justified. Thus, whenever the student cannot go to school, the school must come to him. Consequently, Hospital Pedagogy can be understood as a great inclusion partner.

In the same direction, we have the Statute of the Child and Adolescent - ECA (1989) which ensures the right to education for all children and adolescents, with the guarantee of equal access and permanence, without considering any type of discrimination or exclusion. Thus, it is evident that this statute does not allow any child or adolescent to lose the opportunity to study, much less due to illness or hospitalization.

Among the vast expansion of the axes that guide the educational scenario, we also highlight the role that the National Council for the Rights of Children and Adolescents assumes, especially through Resolution No. 41 (1995), which presents some guidelines that must be applied with full responsibility, with special attention to hospitalized children and adolescents. In this resolution, we highlight item 9, which argues that it is necessary to guarantee the "right to enjoy some form of recreation, health education programs, monitoring of the school curriculum during their hospital stay" (Brasil, 1995, item 9).

According to the Law of Guidelines and Basis of National Education (LDB), No. 9.394 (1996), in Art. 22, it is defended that basic education has the following purposes: "to develop the student, to ensure him the common education indispensable for the exercise of citizenship and to provide him with the means to progress in work and in further studies" (Brasil, 1996, p 17). And, in a complementary way, we have Law 13,716 (2018) that amends the LDB, in Article 4, when it states that it must be:

> [...] educational care is ensured, during the period of hospitalization, to basic education students hospitalized for health treatment in a hospital or home regime for a prolonged time, as provided by the Government in regulation, within the sphere of its federative competence (Brasil, 2018, Art. 4).

According to Silva *et al* (2017, p. 10), if "the purpose of education is to develop the student", it is necessary to understand that "education is inserted in all social spheres", therefore, it "is the right of all", including those who are inmates. Thus, it is up to the Pedagogue's training to promote discussions, studies and reflections that enable him/her "to intermediate educational actions" that go beyond the scope of the school. "These actions can be applied in the school (public and private educational institutions) and non-school (companies, hospitals, residences) spheres".

In Brazil, Hospital Pedagogy dates back to the 30s. According to Cavalcante, Guimarães and Almeida (2015), the inability of students to attend schools is the main factor for the creation of classes in non-school environments. This initiative, without a doubt, is based on moral principles that in the Brazilian case were gradually built. The right to education has expanded the possibility for inmates to continue studying, even if in adverse conditions.

The literature in the area shows that it was in 1939, with the creation of the National Center for Studies and Training for Disabled Children (CNEFEI), that the country took an important step in order to train teachers to work in hospitals and special institutes. The Center's mission was to show that the school is not a closed environment and that it can adapt its activities according to the needs of each student. That same year, the position of hospital professor was made effective.

Pacco and Gonçalves (2019) state that, although some studies point out that hospital classes existed since the beginning of the twentieth century, with pedagogical care for patients with physical disabilities, we cannot affirm that it constituted, in fact, an experience of Hospital Pedagogy. And they highlight the fact that it is only in the 50s that the first written documents about this type of Pedagogy appear in our country.

One of the first records of hospital care took place in the city of Rio de Janeiro, at the Menino Jesus Hospital, where individualized classes were taught by Professor *Lecy Rittmeyer*. Since then, a lot has changed and it is possible to evidence, over the years, the constant evolution and recognition of the importance of hospital classes inserted in the Brazilian educational policy, which has made the service expand to the four corners of Brazil.

THE EXPERIENCE WITH HOSPITAL PEDAGOGY AT HULW

In order to complement our reflections on Hospital Pedagogy, we conducted a study with the HULW (Lauro Wanderley University Hospital) and, more specifically, the extension project "Psychopedagogical Care for Hospitalized Children and Adolescents" as the focus of study and reference. Our intention was to illustrate the role of Hospital Pedagogy in favor of inclusive educational policy, taking the reality of Paraíba for analysis.

To this end, we are guided by the studies of Souza (2017), Araújo (2017), both at the TCC level (course completion work) and Medeiros (2018) at the Master's level, all of which are carried out in UFPB courses. We added to the data collected in these references, the answers from the interview conducted with the coordinating professor of the extension project in focus.

According to Souza (2017), the experience in Hospital Pedagogy only appears in 2001, through the extension project called "Psychopedagogical Care for Hospitalized Children and Adolescents: Alternative Work for the Pedagogue". The project, linked to the Dean of Extension and Community Affairs (PRAC), through the Extension Scholarship Program (PROBEX), is developed by the Department of Pedagogical Qualifications (DHP) of the Education Center (CE), under the coordination of Professor Janine Marta Coelho Rodrigues. It operates uninterruptedly and serves children and adolescents hospitalized in the Pediatrics sector of the Lauro Wanderley University Hospital (HULW), in the city of João Pessoa. The pedagogical services coordinated by the teacher

are carried out by students (scholarship holders and volunteers), mostly from the Pedagogy course at UFPB.

According to Medeiros (2018), although the objective of the project is recognized by the hospital managers, they do not assume any responsibility towards it. Thus, it seems to function independently within the hospital environment, even though it contributes directly or indirectly to the hospital dynamics of children and adolescents.

According to the project coordinator, it "aims to provide children and adolescents with the opportunity to experience pedagogical activities, serving to recover the period they were absent from school", in addition to offering dynamic and pleasurable activities, breaking the hospital routine. In addition, it also constituted an important internship field for Pedagogy students at UFPB, capable of expanding the pedagogue's action to other institutional spaces (SIC).

According to data provided by the coordination, playful schooling activities are developed in a specific space - the hospital's toy library, usually called by the inmates: "hospital school". In this space, pedagogues carry out activities that stimulate the revision of the curricular contents common to the student cycle of the respective interns. These activities include the areas of mathematics, language, science, social studies, arts. They are prepared in a playful way, promoting learning and social coexistence in a pleasant way.

In this regard, Medeiros (2018, p. 10) highlights that the managers confirm the existence and relevance of the project, consider that the hospital service offered can, in fact, "assist in the educational process of hospitalized children and adolescents, as well as contribute to their recovery process". But, even so, it is evident that "the administrators have not participated, planned or discussed the subject" with those who carry out the Hospital Pedagogy project.

According to Souza (2017), the patients' companions generally get involved in the activity of the "hospital school", using these moments to relax and escape from the hospital routine, marked by schedules, procedures, concerns, etc. This fact, it seems to us, has a positive impact on the daily lives of children and adolescents and also their families, according to reports from participants in the project Psychopedagogical Care for Hospitalized Children and Adolescents: Alternative Work for the Pedagogue. Therefore, it should be more valued by the hospital structure as a whole.

It is important to highlight, as the project coordinator points out, that it is part of the Center for Studies, Projects and Research on Teacher Training – NEPESF, also coordinated by Professor Janine Marta Coelho Rodrigues, which provides the members with a fruitful articulation between research and extension, provoking important reflections in the area, as attested by the coordinator, when she states that throughout its 18 years of existence, The project had the participation of 23 students as extension workers. Of these, 18 were scholarship holders of the project.

Since its execution, Professor Janine reports that the project has been the subject of 21 Course Completion Papers (TCC), 04 dissertations, 02 theses and 18 articles. It has provided the participation of 16 publications in national and 05 international congresses and symposia. In addition to 06 mini courses and 04 seminars. In view of this, it is important to note the prominence that this theme has been gaining over the years in educational and training spaces, since it provides an understanding of the concept and how Hospital Pedagogy is exercised.

In addition to the Pedagogy course, the project "Psychopedagogical Care for Hospitalized Children and Adolescents" has already opened space for other students from different courses at UFPB, especially as a research field for TCC, monograph, dissertation and thesis.

On the other hand, as Araújo (2017) says, it is necessary to discuss and broaden the debate on the challenges and possibilities of the pedagogue's performance in the hospital environment, so that this professional is valued, with regard to the educational care of hospitalized children and young people. Corroborating this statement, the coordinator of the project "Psychopedagogical Care for Hospitalized Children and Adolescents: Alternative Work for the Pedagogue" highlights the fact that there are more than 4,000 inmates and more than 1,000 companions involved in the activities carried out weekly.

In fact, it is a very expressive number that deserves to be valued. In the hospital, there is a turnover of children and young people, considering that the length of hospital stay varies greatly from intern to intern. Such rotation is a great challenge for pedagogues, as activities need to be updated weekly, considering that the internal students of one week may not be the same the next week – either because they were discharged, transferred or died.

Thus, the relationship between pedagogue and intern can be quick or long-lasting, but, in hospital dynamics, what has mattered most is that this relationship is affective and true and that it alleviates pain, stimulates hope and provokes joy for as long as possible. Therefore, Hospital Pedagogy cannot ignore inclusion, since it carries with it respect and solidarity, as the mainsprings of its actions.

CONCLUSIONS

The reflections made throughout this study demonstrated that there are different spaces for the construction of knowledge, and that the hospital is one of them. Therefore, the pedagogical practice developed in the hospital, with hospitalized children and young people, brings with it a differentiated character – that of being inclusive, as it works with the differences between subjects, conditions and environments.

From this perspective, Hospital Pedagogy is one of the main partners of inclusion as a broad policy that is not limited to specific groups, considering that hospitalization is not a privilege of a

few. In fact, anyone can be hospitalized for the most diverse reasons. And, when it comes to children and adolescents, they need to have their educational rights guaranteed, since this is what our legislation defends.

On the other hand, the study made us see that Hospital Pedagogy also stimulates creativity in the pedagogue, the flexibility of his practices, in addition to the innovation of resources, respecting the effective conditions of the internal student. In fact, it is a highly enriching experience for pedagogues.

Thus, it can be considered that Hospital Pedagogy provides children and adolescents with the right to education, as provided for in our legislation, and seeks to do so from an absolutely new place for most educators – in the hospital, considered an inhospitable environment. So, the great challenge that the Hospital Pedagogue presents itself to is to lead the student, even in a situation of suffering, to obtain satisfaction in learning.

Therefore, for hospital pedagogues, it is not enough for intern students to be able to continue the schooling process, feeling included in the education network. It is necessary that the educational moments promoted by the hospital pedagogue make it possible to alleviate the pain, boredom and fears typical of the condition of hospitalization.

In general, the service proposal is individualized, and the pedagogue must build each stage with the student and his or her family, also taking into account the opinions and guidelines given by the medical team that accompanies the patient and other professionals involved in the treatment.

Finally, we believe it is prudent to consider that illness and hospitalization entail numerous challenges to learning, such as: anxiety, fear and anguish. And these feelings are increased as the hospitalization is delayed, to the detriment of the absence of their old routine, especially with family and school, where most of their friends are concentrated. For this reason, we understand that Hospital Pedagogy is not only an educational action, but it is also an affectionate and hopeful action for those who are excluded from everything – including the home.

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Sleep quality of university students with bruxism-type craniomandibular disorders: An integrative review of the literature

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Caroline Alvarenga de Assis Santana[1]

ABSTRACT

Bruxism is characterized by teeth grinding, divided into sleep bruxism and daytime bruxism, and can be classified into primary and secondary. The main causative factors are poor sleep quality, stress, anxiety, alcohol consumption and smoking. The objective of this study was to investigate, through a literature review, the quality of sleep of university students with bruxism. An integrative literature review type research was carried out, carried out in the following databases: VHL, Google Scholar, SciELO and PuBMeD with the descriptors: Students, Sleep Quality, Poor Sleep Quality, University Students, Academics, Bruxism. Searches in electronic databases returned a total of 170 articles, 68 in the VHL, 47 in SciELO and 55 in PuBMeD. A total of 5 studies met the eligibility criteria. According to selected studies, there is a prevalence of sleep bruxism in adults with obstructive sleep apnea, however, the prevalence differs between age group, sex and race, sleep bruxism causes individuals to present insomnia, depression, behavioral disorders, REM sleep and sleep-related epilepsy. A correlation was found between bruxism during sleep and wakefulness, due to the reuptake of serotonin, a hormone that regulates stress. There is a significant association between psychological factors and awake bruxism. The research's main obstacles were the scarce source of materials on the topic of the correlation between sleep quality and bruxism, making it essential to develop new studies on larger population scales.

Keywords: Bruxism, Sleep quality, College students.

[1] PhD in Human Development and Technologies – State University of São Paulo
Physiotherapist, professor at the State University of Minas Gerais

INTRODUCTION

Sleep disorders are a group of conditions that affect the ability to sleep and cause impairment in social and occupational functions. Sleep can be disturbed by irregular bedtimes, activities before bed, stress, diet, illness, and medications. The most common types of sleep disorders are insomnia, snoring and obstructive sleep apnea (OSA), bruxism and sleepwalking (DRABOVICZ et al. 2012; FERNANDES, G., 2011). Bruxism is characterized by teeth grinding and is divided into sleep bruxism and daytime bruxism and classified into primary and secondary. The main causative factors are poor sleep quality, stress, anxiety, alcohol consumption and smoking. Based on the statement that academic life requires great efforts, the causes mentioned above generally coincide with the reality of university students, making them a group predisposed to bruxism (ARAÚJO et al., 2013; SÁ et al., 2017).

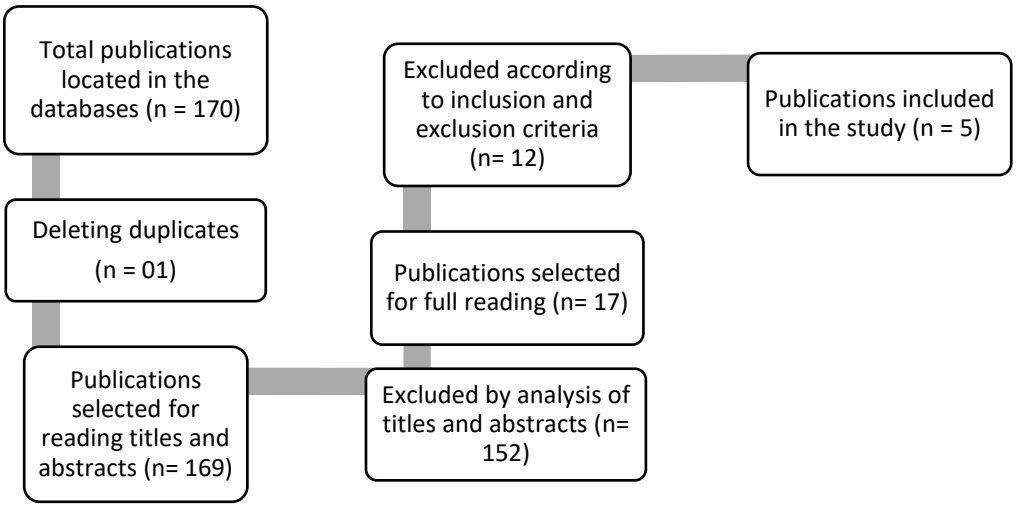
University students have irregular sleep patterns due to the strong pressure and stress related to the high demand for activities, making them a group totally susceptible to sleep disorders that are becoming more and more recurrent, regardless of age (COSTA et al., 2017; LOBBEZOO et al., 2013). Analyzing bruxism and its relationship with the quality of sleep in university students contributes to scientific knowledge for the prevention and treatment of bruxism that compromises the quality of life of this population. Therefore, the objective of this study was to investigate, through an integrative literature review, the quality of sleep of university students with bruxism.

MATERIALS AND METHOD

An integrative literature review type research was carried out, with a search for scientific articles carried out in the databases: VHL, Google Scholar, SciELO and PuBMeD and a search strategy involving descriptors: *Students, Sleep Quality, Poor Sleep Quality, University Students, Academics, Bruxism.* The descriptors were taken from previous research and used in all databases.

The inclusion criteria were: articles found in full, in English, Portuguese and Spanish, which evaluated the quality of sleep-in university students. Articles that were not freely available were excluded. The selection of articles occurred in three stages. In the first stage, the titles of all studies found through the electronic search were read and analyzed and then those that did not meet the established inclusion criteria were excluded. In the second stage, the abstracts of the studies selected in the previous stage were read and analyzed and those that did not meet the eligibility criteria were excluded. In the third stage, a complete reading of the studies selected in the previous stages was carried out. Article search strategy presented in Figure 1.

Figure 1 – Search strategy for scientific articles



RESULTS AND DISCUSSION

Searches in electronic databases returned a total of 170 articles, 68 in the VHL, 46 in SciELO and 55 in PuBMeD 1 Google Scholar. Of these studies, only one was a duplicate and 149 were excluded because they did not meet the previously established inclusion criteria. After reading the 20 summaries of the remaining studies, three articles were excluded, leaving 17 articles and after reading the articles in full, 12 were excluded due to the sample being incompatible with university students. A total of five studies met the eligibility criteria and were included in the present review.

The selected articles were described (Table 1), classified according to the study objectives, the sample (age), the evaluation instruments and the study results, allowing a detailed analysis of each one.

Among the articles found, there was a prevalence of observational cross-sectional studies, with the most used assessment instruments being the *Epworth Excessive Sleepiness Scale* (ESS); *Pittsburgh Sleep Quality Index* (PSQI); *Diagnostic Criteria for Temporomandibular Disorders* (DC/TMD); *Oral Behavior Checklist* (OBC); and Polysomnography.

Table 1 – Characterization of articles selected for review

TITLE / AUTHOR	GOAL	MATERIAL AND METHOD	CONCLUSION
1 - Sleep bruxism, awake bruxism and Sleep quality among Brazilian dentists. SERRA-NEGRA et al., 2014.	evaluate the association of sleep bruxism and awake bruxism and sleep quality among dentistry students at the Federal University of Minas Gerais, Belo Horizonte, Brazil.	Cross-sectional study. The instruments used were questionnaires to assess bruxism during sleep and awake and the Epworth Sleepiness Scale.	Poor sleep quality was present among university students who reported sleep bruxism and among those who presented daytime bruxism.
2 - Sleep disorders and bruxism. CASTELLANOS et al., 2018.	Explain the relationship between sleep and increased activity of the masticatory muscles (bruxism).	Literature review. Articles for this study were selected from Medline, PubMed and Ebsco .	Bruxism is related to the neurosensory mechanism, where there is a lack **of** control in communication between the brain and the chewing muscles. For better management and control of bruxism associated with sleep disorders, assistance and supervision from multi and interdisciplinary teams are important.
3- COVID 19 and its impact on the Psychosocial aspect, Sleep, Temporomandibular Disorders and Bruxism in Medicine undergraduates and Health Residents at the School of Medicine of Medical Sciences / UFRN. PEIXOTO, K. O, 2022.	Assess the consequences of COVID 19 on the psychosocial state, signs and symptoms of TMD, sleep bruxism and waking bruxism.	Cross-sectional study. The instruments used were: Pittsburgh Sleep Quality Index and Epworth Sleepiness Scale .	There was a high prevalence of stress, poor sleep quality and sleep bruxism related to TMD and orofacial pain.
4- The occurrence of respiratory events in young people with frequent rhythmic masticatory muscle activity. ARAKIA et al., 2017.	To evaluate rhythmic masticatory muscle activity and concomitant respiratory events in young people with sleep bruxism who are asymptomatic with obstructive sleep apnea.	Cross-sectional study. Epworth Excessive Sleepiness Scale and polysomnography.	Participants with sleep bruxism presented respiratory events concomitant with oromotor events .
5- Associations between sleep bruxism and other sleep-related disorders in adults. KUANG et al., 2021.	Understand the occurrence of sleep bruxism in patients with other sleep disorders.	Systematic literature review with articles selected from PubMed , Embase, Cochrane and Web of Science.	Sleep bruxism has been associated with several sleep disorders such as: Obstructive sleep apnea, restless legs syndrome, insomnia and others.

Table 1 presents the five articles included in the research showing the prevalence of BS in adults with OSA, however, the prevalence of Sleep Bruxism (BS) differs between age groups, sexes and races. Thus, the diversity of these factors may contribute to the variation in the prevalence of BS in scientific studies. The prevalent age range in the studies was between 19 and 24 years old, the majority of participants were female and the most common signs and symptoms were teeth grinding or clenching and muscle pain (SERRA-NEGRA et al., 2014; SHINGO et al., 2017).

BS has been correlated with other sleep disorders in addition to OSA, causing individuals to present insomnia, depression, REM sleep behavior disorder and sleep-related epilepsy, making it important to screen for BS in patients with sleep-related disorders (KUANG et al., 2021). A correlation was also found between bruxism during sleep and wakefulness, due to the reuptake of serotonin, a hormone that regulates stress (GUZMÁN, DELGADO, CASTELLANOS, 2018). BS increases the frequency of micro-awakenings, causing insomnia and daytime drowsiness, increasing stress, mood changes, increased levels of anxiety, causing the appearance or increase of daytime bruxism.

The opposite is also true, that is, the increase in daytime levels of anxiety and stress means that the individual does not have restful sleep, influencing the number of micro-awakenings which, as mentioned above, can initiate or worsen nocturnal bruxism, creating a vicious circle. Peixoto et al. (2022) expose the reality of university students and residents facing COVID-19, highlighting the significant association between psychological factors (stress, anxiety, depression) with awake bruxism.

As explained by Manfredini et al. (2016), Pestana et al. (2019), Carvalho et al. (2020), it is observed that before seeking an analysis of the consequences of bruxism, it is necessary to understand the current epidemiology of bruxism during sleep and awake to identify whether bruxism is related to a disorder, habit or phenomenon.

Pain is the main cause of poor quality of life in individuals with temporomandibular disorders or dysfunctions, however, it is important to highlight that studies correlating quality of life with bruxism are still increasing, seeking to diagnose bruxism since it is increasingly present in current society, with greater occurrence among young people (ALMOZINO et al., 2015; CARVALHO et al., 2015; DONNARUMMA et al., 2010).

Sleep bruxism is associated with a higher level of education and psychological stress. There is no prevalence of sleep bruxism in relation to sex, however, it is prevalent in individuals over 40 years of age (ALENCAR et al., 2020; COSTA et al., 2010; MELLO et al., 2017) . Sleep quality is associated with sleep bruxism, daytime sleepiness, sex and hours of sleep. The literature shows that poor sleep quality in young people with bruxism is greater in females, who sleep less than eight hours a night (SOUSA, 2017; BEZERRA, 2020; BATISTA et al., 2022; BALTAZAR, 2018; BERTOLAZI et al., 2011).

The scarcity of research on this topic with the young population was a limiting factor for delving deeper into the subject. The correlation between sleep quality and bruxism is still little studied in the area of physiotherapy, being more emphasized by dentistry, and the development of new research with larger samples with a young population diagnosed with bruxism is essential.

CONCLUSION

The literature reveals that bruxism is related to stress, anxiety, depression and other psychological, neurological and respiratory comorbidities, as well as individuals' night and day habits, impairing the quality of sleep of university students. Bruxism is a multifactorial disease requiring multidisciplinary treatment by a team of physiotherapists, dentists and other health professionals.

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Impact of chronic stress on cardiovascular health in young women

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Matheus Silva Lima[1], Natália Kisha Teixeira Ribeiro[2], Lucas de Almeida Rocha[3], Samuel Winicius dos Santos Alves[4], Ana Luisa Gonçalves Felipe[5], Maria Eduarda Moura Silva[6], Cássyo Santos Monteiro[7], Paulo Henrique Schmidt Gutierres[8], Gabriel Rigo Bianchi[9] and Ana Clara Barreto e Silva[10]

ABSTRACT

Chronic stress has been recognized as a significant risk factor for cardiovascular disease (CVD), especially in young women. This chapter explores the complex relationship between chronic stress and cardiovascular health, highlighting the specific vulnerabilities of young women and the implications for prevention and treatment. Current research suggests that chronic stress can affect cardiovascular health through multiple pathways, including physiological, behavioral, and psychosocial changes. Young women can be particularly susceptible due to hormonal, social, and cultural factors. Effective stress management and cardiovascular health promotion strategies are crucial to reduce the risk of CVD in this population.

Keywords: Chronic stress, Cardiovascular diseases, Young women, Cardiovascular health, Prevention.

[1] Medical Student- Federal University of Northern Tocantins – UFNT
[2] Medical Student- Federal University of Northern Tocantins – UFNT
[3] Medical Student- Federal University of Northern Tocantins – UFNT
[4] Medical Student- Federal University of Northern Tocantins – UFNT
[5] Medical Student- Federal University of Northern Tocantins – UFNT
[6] Medical Student - Centro Universitário Tocantinense Presidente Antônio Carlos
[7] Medical Student- Federal University of Serjipe – UFS
[8] Medical Student – FEEVALE
[9] Medical Student – FEEVALE
[10] Medical Student- Federal University of Mato Grosso

INTRODUCTION

Cardiovascular disease (CVD) remains the leading cause of death worldwide, affecting both men and women. Although it was traditionally believed that CVD was more prevalent in men, recent research has shown an alarming increase in CVD incidence and mortality in women, especially in younger age groups [1,2]. Chronic stress, an increasingly common condition in modern society, has been identified as a crucial risk factor for the development of CVD in young women [3].

Chronic stress can be defined as prolonged exposure to stressors such as work pressures, family problems, financial difficulties, or emotional trauma. This continuous exposure triggers a series of physiological and behavioral responses that, in the long run, can compromise cardiovascular health. In young women, factors such as hormonal fluctuations, family responsibilities, and social pressures can exacerbate the effects of chronic stress on heart health [3].

The relationship between chronic stress and cardiovascular health is complex and multifactorial. Studies have shown that chronic stress can lead to physiological changes, such as increased blood pressure, dyslipidemia, insulin resistance, and inflammation, which are well-established risk factors for CVD [4]. In addition, chronic stress can influence risky behaviors, such as smoking, excessive alcohol consumption, poor diet, and sedentary lifestyle, which also contribute to the development of CVD.

Young women may be particularly vulnerable to the effects of chronic stress on cardiovascular health due to a number of factors. Hormonal fluctuations throughout the menstrual cycle, pregnancy, and menopause can influence the stress response and increase the risk of CVD [5]. In addition, young women often face social and cultural pressures related to work, family, and motherhood, which can generate chronic stress and compromise cardiovascular health.

Awareness of the impact of chronic stress on the cardiovascular health of young women is critical for the prevention and early treatment of CVD. It is essential that health professionals, educators, and society in general are aware of the signs and symptoms of chronic stress in this population, offering support and referring them to appropriate treatment when necessary. Early diagnosis and timely intervention can significantly reduce the risk of CVD and its complications, ensuring a better quality of life for these women.

METHODS

This chapter was elaborated from a narrative review of the scientific literature on the impact of chronic stress on the cardiovascular health of young women. The search for relevant articles was carried out in the PubMed, Scopus and Web of Science databases, using the following keywords: "chronic stress", "cardiovascular diseases", "young women", "cardiovascular health" and

"prevention". Articles published in the last 10 years, in English or Portuguese, that addressed the topic directly or indirectly, were included.

The selection of articles was carried out in two stages. In the first stage, the titles and abstracts of the articles identified in the search were analyzed, excluding those that did not fit the theme or that presented low methodological quality. In the second stage, the full articles were read and critically evaluated, selecting those that provided the most robust and relevant evidence for the chapter.

RESULTS

IMPACT OF CHRONIC STRESS ON CARDIOVASCULAR HEALTH

Chronic stress triggers a cascade of physiological responses that may contribute to the development of CVD in young women. Activation of the hypothalamic-pituitary-adrenal axis leads to the release of cortisol, a stress hormone that, at chronic elevated levels, can promote hypertension, dyslipidemia, insulin resistance, and inflammation, all of which are risk factors for CVD [4, 13]. In addition, chronic stress can lead to activation of the sympathetic nervous system, resulting in increased heart rate, blood pressure, and vasoconstriction, which also contributes to cardiovascular risk [6].

RISK FACTORS AND VULNERABILITIES

Several individual, social, and cultural risk factors can increase the vulnerability of young women to chronic stress and its impacts on cardiovascular health. Individual factors include family history of CVD, traumatic childhood experiences, anxiety and depression disorders, and low self-esteem [3]. Social and cultural factors include pressures related to work, family, motherhood, and body image, as well as gender inequalities and discrimination [3, 10].

CLINICAL MANIFESTATIONS

Chronic stress can manifest itself in several ways in the cardiovascular health of young women. Hypertension is one of the main consequences, and can lead to damage to blood vessels, the heart, and other organs. Coronary artery disease, characterized by narrowing of the arteries that supply the heart, can also be triggered or aggravated by chronic stress, increasing the risk of angina, myocardial infarction, and sudden death [5]. In addition, chronic stress has been linked to other cardiovascular conditions such as cardiac arrhythmias, heart failure, and stroke [7].

PREVENTION AND TREATMENT STRATEGIES

The prevention and treatment of chronic stress and its impacts on the cardiovascular health of young women involves a multidisciplinary approach, which includes lifestyle interventions, psychological therapies and, in some cases, pharmacological treatment. Adopting a healthy lifestyle, with a balanced diet, regular physical activity, adequate sleep, and relaxation techniques such as meditation and yoga, can help reduce stress levels and improve cardiovascular health [7].

Psychological therapies, such as cognitive behavioral therapy, can be effective in managing chronic stress and preventing its negative effects on cardiovascular health. In some cases, pharmacological treatment with antidepressants or anxiolytics may be necessary to control symptoms of anxiety and depression, contributing to the reduction of cardiovascular risk.

DISCUSSION

The results of the literature reviewed in this chapter show the strong association between chronic stress and increased risk of CVD in young women. This relationship is complex and multifactorial, involving pathophysiological mechanisms, such as the activation of the hypothalamic-pituitary-adrenal axis and the sympathetic nervous system, as well as individual, social, and cultural risk factors that increase the vulnerability of young women to the effects of stress.

The clinical manifestations of chronic stress on cardiovascular health are diverse, including hypertension, coronary artery disease, cardiac arrhythmias, heart failure, and stroke. Early identification of these signs and symptoms is crucial for timely treatment and prevention of serious complications.

Effective prevention and treatment strategies must address both the physiological and psychosocial aspects of chronic stress. The adoption of a healthy lifestyle, combined with psychological therapies and, if necessary, pharmacological treatment, can contribute to reducing the risk of CVD in young women. However, it is essential that these interventions are personalized and consider the needs and particularities of each woman, including her social, cultural, and economic contexts.

In addition, it is important to highlight that the stress response can vary between individuals and that not all young women exposed to chronic stress will develop CVD. Factors such as resilience, social support, and access to healthcare resources can influence how stress affects cardiovascular health.

CONCLUSION

Chronic stress poses a significant challenge to the cardiovascular health of young women. Understanding the pathophysiological mechanisms, risk factors, and clinical manifestations of

chronic stress is essential for the development of effective prevention and treatment strategies. Awareness of this problem and early diagnosis are essential to reduce the risk of CVD and its complications, ensuring a better quality of life for this population. It is crucial for health professionals, educators, and society at large to be aware of the signs and symptoms of chronic stress in young women, offering support and referral for appropriate treatment when necessary. Early diagnosis and timely intervention can significantly reduce the risk of CVD and its complications, ensuring a better quality of life for these women.

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Maternal mortality in Brazil during the Covid-19 pandemic and post-pandemic period

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Maria Joedna Ferreira Monteiro[1], Ana Cristina Henrique de Souza[2], Larissa Ellen de Souza Oliveira[3], Alzenir Rosa Viana[4] and Dayanne Rakelly de Oliveira[5]

ABSTRACT

Maternal death occurs in the pregnancy-puerperal period due to causes directly linked to gestational conditions or by indirect causes resulting from pre-existing maternal conditions that worsen as a result of pregnancy. The coronavirus pandemic has posed a challenge for health care. The consequence of this was a considerable increase in the Maternal Mortality Ratio, reaching alarming values in the peak period of the pandemic. This study aims to identify the main causes of maternal death, which Brazilian regions obtained the highest values of deaths, and what is the period of the pregnancy-puerperal cycle in which these deaths occurred. This is an ecological, descriptive and quantitative analytical study built using data from the DataSus Information System in the period from 2019 to 2022. MMR increased significantly during the pandemic, especially in 2021. The Southeast and Northeast regions recorded the highest numbers of maternal deaths. Maternal mortality causes were divided into direct (complications of pregnancy, childbirth, or puerperium) and indirect (pre-existing conditions aggravated by pregnancy), with a notable increase in indirect causes during the pandemic. Maternal mortality rates were highest among women aged 20 to 39 years, highlighting a significant vulnerability in this age group. Regional and socioeconomic inequalities were critical factors, with black women having the highest mortality rates. The lack of access to adequate health care during the pandemic exacerbated the situation, preventing prenatal, childbirth and postpartum care, which is essential for maternal health.

Keywords: Brazil, COVID-19, Maternal death, Pandemic.

[1] Undergraduate student in nursing
E-mail: Joedna.monteiro@urca.br
[2] Nursing Undergraduate
E-mail: Anacristina.henrique@urca.br
[3] Nursing Undergraduate
E-mail: larissa.ellen@urca.br
[4] Nursing Undergraduate
E-mail: alzenir.viana@urca.br
[5] Doctorate
E-mail: Dayanne.oliveira@urca.br

INTRODUCTION

In 2020, the World Health Organization (WHO) declared an outbreak of the new coronavirus and declared a state of pandemic due to the high transmission power of the disease. COVID-19 is caused by the Sars-CoV-2 virus, which, despite having been classified as having a low lethality potential, had a high potential for geographic transmission and morbidity, in addition, it is worth mentioning the lack of preparation of services, the lack of inputs and specific pharmacological methods. According to the Coronavirus Monitoring Panel, Brazil has recorded 712,571 deaths and more than 30 million cases, these numbers demonstrate the Brazilian situation during the pandemic (Souza; Amorim, 2021).

Maternal mortality is defined as the death of the woman during the pregnancy-puerperal period. It can happen during pregnancy, labor, delivery and up to 42 days after the end of pregnancy, not depending on the duration or location of the pregnancy. It is classified as obstetric causes as direct, when it is related to the physiology of pregnancy, obstetric complications resulting from inadequate treatments, omissions or unnecessary interventions, and indirect, when resulting from pre-existing pathologies, but which were aggravated by the dynamics of pregnancy (Brasil, 2022).

To analyze the evolution of maternal deaths and indicate measures for maternal and child health, the Maternal Mortality Ratio (MMR) is calculated, obtained through the number of maternal deaths divided by the number of live births and multiplied by 100,000. It is an important indicator, also known as the mortality rate, and represents, when high, low socioeconomic conditions and difficulties in obtaining quality of care, and is used to guide health actions (Brasil, 2018).

The numbers of maternal deaths have always been the focus of attention. Before the pandemic period, the MMR was around 50 per 100,000 live births, and with the advent of the covid-19 pandemic, this situation worsened significantly, reaching 7.2% in this period. During the gestational period, a woman's body undergoes several anatomical and physiological changes, contributing to the development of the most severe forms of the disease, in addition to requiring intensive care beds, the use of respiratory ventilation, and operating rooms due to the greater likelihood of babies being born prematurely (Castro, 2021).

In this scenario, the high rates of maternal mortality are notorious, allied to this situation are the absence of family planning, the lack of prenatal care, with few prenatal consultations, both due to the fear of becoming infected and the difficulty of access to services, as well as postnatal care, thus contributing to the increase in deaths (Guimarães; Moreira, 2024).

The United Nations (UN) has established, as part of the Millennium Development Goals, the commitment to reduce maternal mortality by the year 2015. However, some countries, including Brazil, have not met this goal. In 2015, the 2030 Agenda was launched, with the objective of resuming the goal of reducing maternal death rates to less than 70 deaths per 100 thousand live births

according to Sustainable Development Goal (SDG) 3.1. Brazil was more ambitious and proposed to reduce mortality to 30 deaths per 100,000 live births. However, Maternal Mortality must be analyzed through regional discrepancies and it must be understood that it is influenced by the economic status of the population and the national context (Motta; Costa, 2021).

Therefore, it is necessary to research the causes of maternal mortality in the pandemic period and after the covid 19 pandemic, in the most prevalent regions and what is the socioeconomic profile of these women.

METHODOLOGY

A descriptive and quantitative analytical ecological study of maternal mortality in Brazil was carried out, built using secondary statistical data extracted from the tabnet of the DATASUS informatics department in the period from 2019 to 2022. The data collected were on maternal deaths in the Brazilian regions and the federal district in the period from 2019 to 2022 in the Mortality Information System (SIM) and in the Live Birth Information System (Sinasc).

In Sinasc, the number of live births in the Brazilian regions was researched and the data were obtained as follows: Searched in the field line by region; in the column field the year and in content maternal deaths. Next, the region of occurrence was searched in the row field, in the year column field and in the content births by mother's residence.

Maternal death was searched in the Mortality Information System by analyzing the number of maternal deaths, obstetric causes of death, and socioeconomic profile, and separated by major regions of Brazil and year of occurrence, from 2019 to 2022. The research was carried out in three stages, as follows: in the Line field year of death; in the field column region and in Content: maternal deaths to obtain deaths by region. After that, in the field Line type of obstetric cause; in the Field column year of death; Content: maternal deaths to identify the most prevalent causes of death. Subsequently, in the Age group line field; Column year of death; Contents Maternal deaths. Then, it modified the pregnancy/puerperium death line in the field to analyze the period of highest occurrence of deaths.

To specify and evaluate the causes of maternal mortality, chapter XV (pregnancy, childbirth and puerperium) of ICD 10 (International Statistical Classification of Diseases and Related Health Problems) was used. The tabulation of the data and the creation of the graphs were done in the Microsoft Excel program and the tables and analysis of the study were developed in Microsoft Word.

As these are aggregated data in Information Systems available on the Internet and in the public domain, the approval of the Research Ethics Committee is waived.

RESULTS

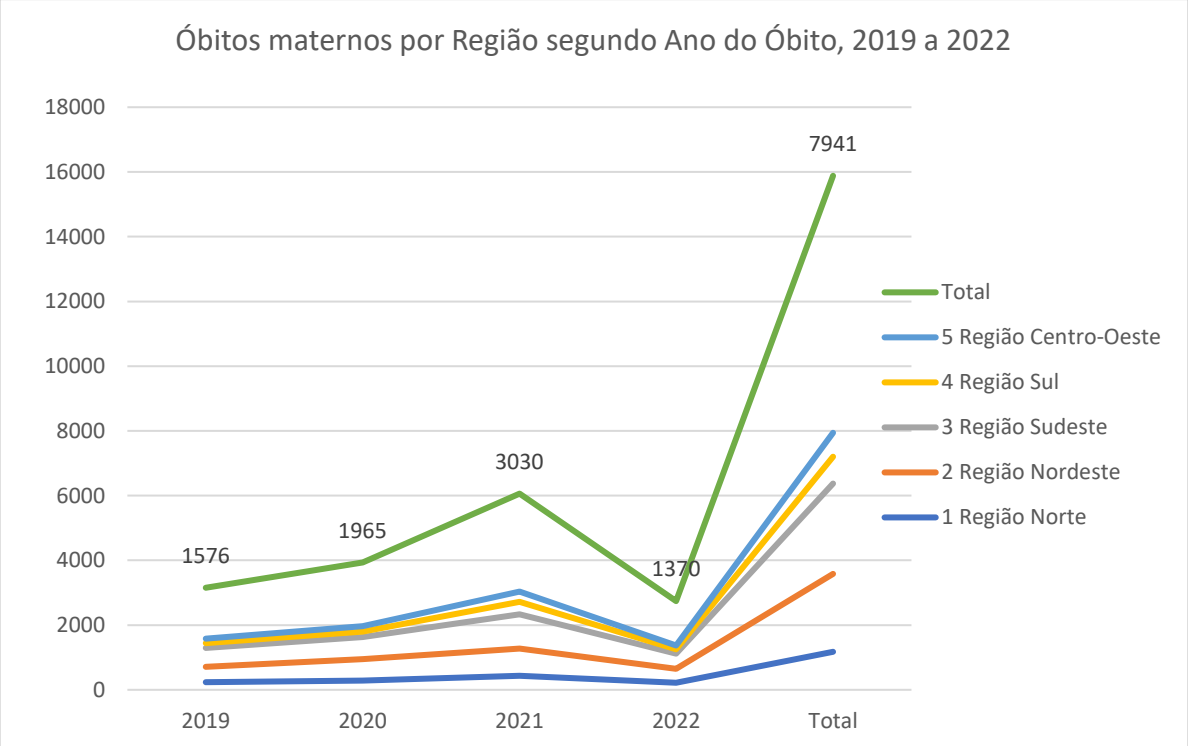
In Brazil, during the Covid 19 pandemic, the number of deaths increased considerably, reaching 619,056 deaths during 2021 and totaling 38,840,012 cases by 2024. The Southeast region, followed by the Northeast region, has the highest numbers of maternal deaths during the 2021 year of the Covid-19 pandemic.

Table 1. Maternal deaths by region according to year of death, 2019 to 2022.

Year of death	North	Northeast	Southeast	South	Midwest	Total
2019	233	478	582	147	136	1576
2020	285	662	685	162	171	1965
2021	438	838	1055	385	314	3030
2022	218	430	469	135	118	1370
Total	1174	2408	2791	829	739	7941

Source: Mortality Information System (SIM).

Figure 1. Maternal deaths by region according to year of death, 2019 to 2022.



Source: Mortality Information System (SIM).

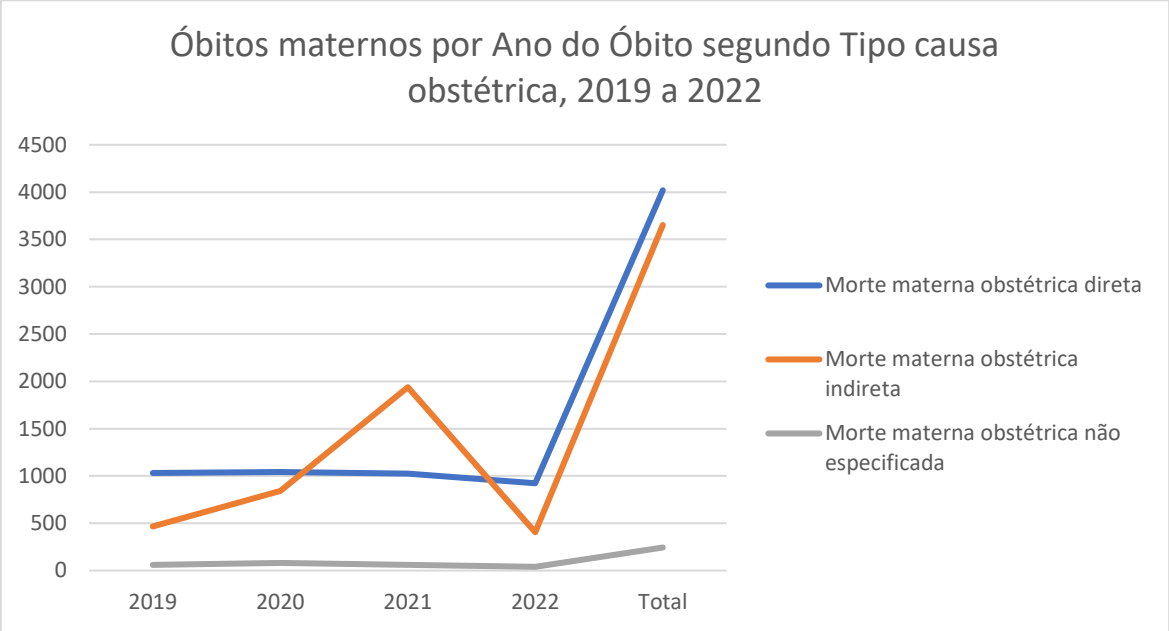
Considering the direct causes (associated with complications in pregnancy, childbirth or puerperium); indirect (associated with pre-existing conditions of pregnancy, childbirth and puerperium) and late (period longer than 42 days). Direct obstetric causes accounted for 50.8% during the study period and indirect causes 46.1%, and indirect obstetric causes in 2021 increased considerably in relation to direct causes.

Table 2. Maternal deaths by year according to the type of obstetric cause, 2019 to 2022.

Obstetric cause	2019	2020	2021	2022	Total
Direct obstetric causes	1032	1040	1028	923	4019
Indirect obstetric causes	466	843	1939	495	3652
Not specified	62	81	61	40	244
Total	1560	1964	3023	1368	7915

Source: Mortality Information System (SIM).

Figure 2. Maternal deaths by year by age group, 2019 to 2021.



Source: Mortality Information System (SIM).

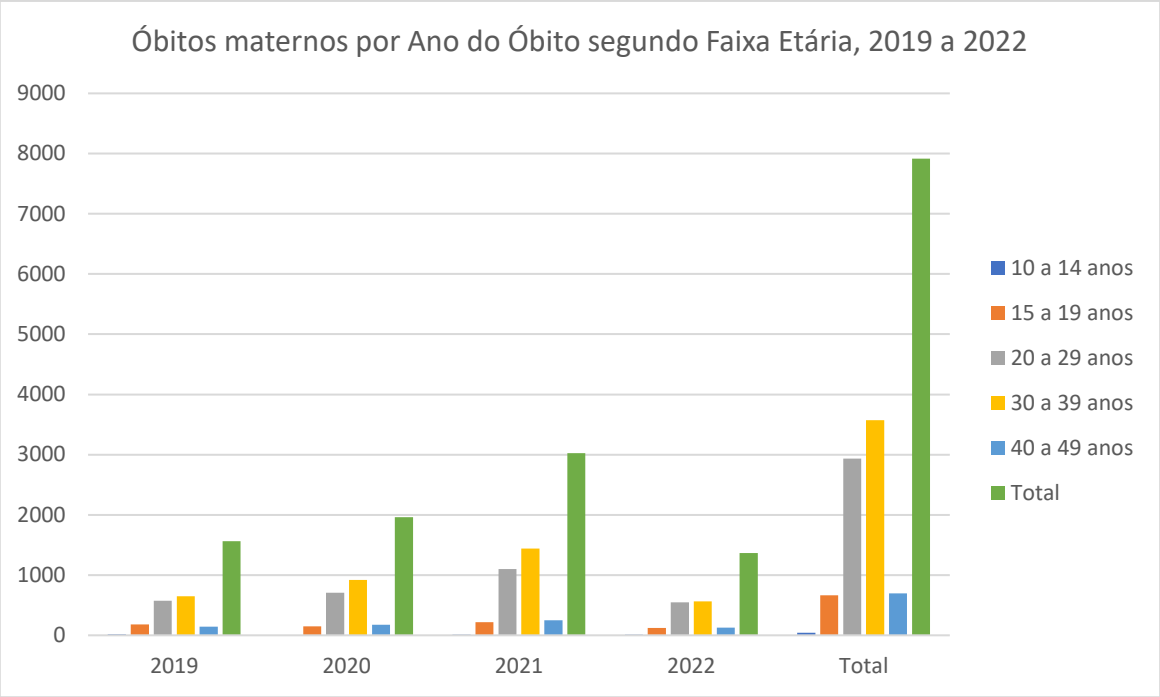
Maternal mortality during childbearing age (age group between 10 and 49 years according to the Ministry of Health) increased, especially between the ages of 20 to 29 years and 30 and 39 years, 1103 and 1441 respectively, during the year 2021.

Table 3. Maternal deaths by year by age group, 2019 to 2021.

Age group	2019	2020	2021	2022	Total
10 to 14 years old	14	7	11	12	44
15 to 19 years old	181	148	218	120	667
20 to 29 years old	574	709	1103	548	2934
30 to 39 years old	649	922	1441	561	3573
40 to 49 years old	143	178	251	127	699
Total	1561	1964	3024	1368	7917

Source: Mortality Information System (SIM).

Figure 3. Maternal deaths by year by age group, 2019 to 2021.



Source: Mortality Information System (SIM).

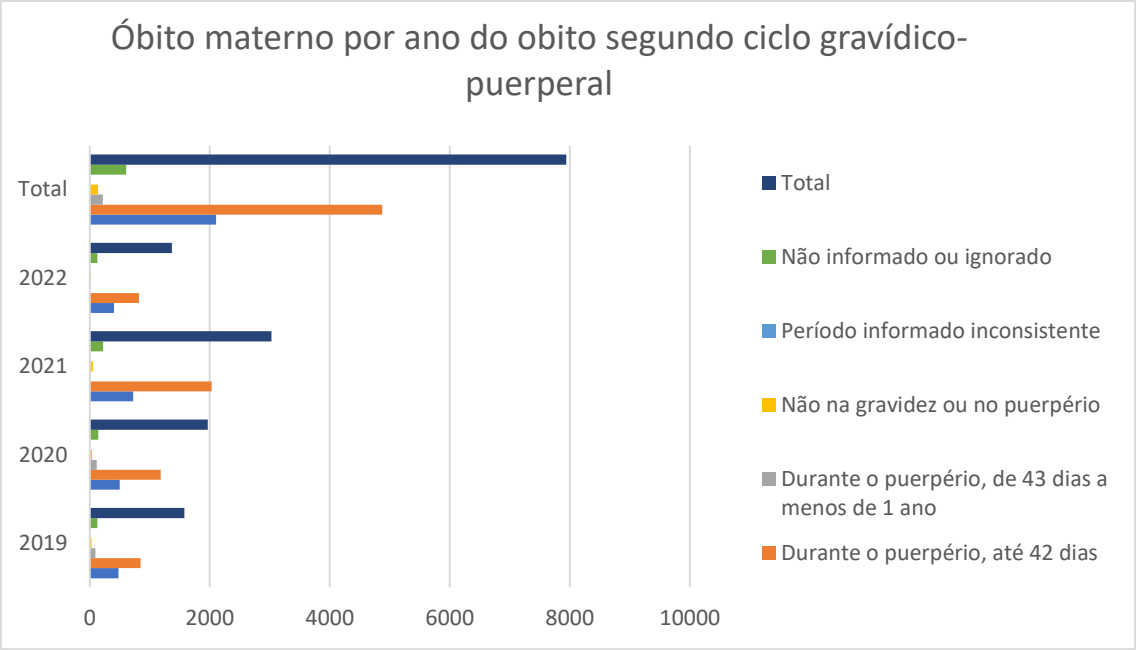
Considering the pregnancy period (labor, delivery and abortion) and the immediate puerperium up to 42 days and mediate (over 42 days up to one year). Maternal deaths were high during the puerperal period, reaching values of 1180 and 2029, in 2020 and 2021, respectively.

Table 4. Maternal deaths by Year of Death according to Death pregnancy/puerperium, 2019 to 2022.

Maternal deaths by Year of Death according to Death pregnancy/puerperium, 2019 to 2022					
Death pregnancy/puerperium	2019	2020	2021	2022	Total
During pregnancy, childbirth, or miscarriage	480	499	722	405	2106
During the puerperium, up to 42 days	847	1180	2029	817	4873
During the puerperium, from 43 days to less than 1 year	92	113	9	-	214
Not in pregnancy or in the postpartum period	30	34	50	21	135
Inconsistent reporting period	2	-	1	2	5
Not informed or ignored	125	139	219	125	608
Total	1576	1965	3030	1370	7941

Source: Mortality Information System (SIM).

Figure 4. Maternal deaths by year of death during pregnancy/puerperium cycle, 2019 to 2022.



Source: Mortality Information System (SIM).

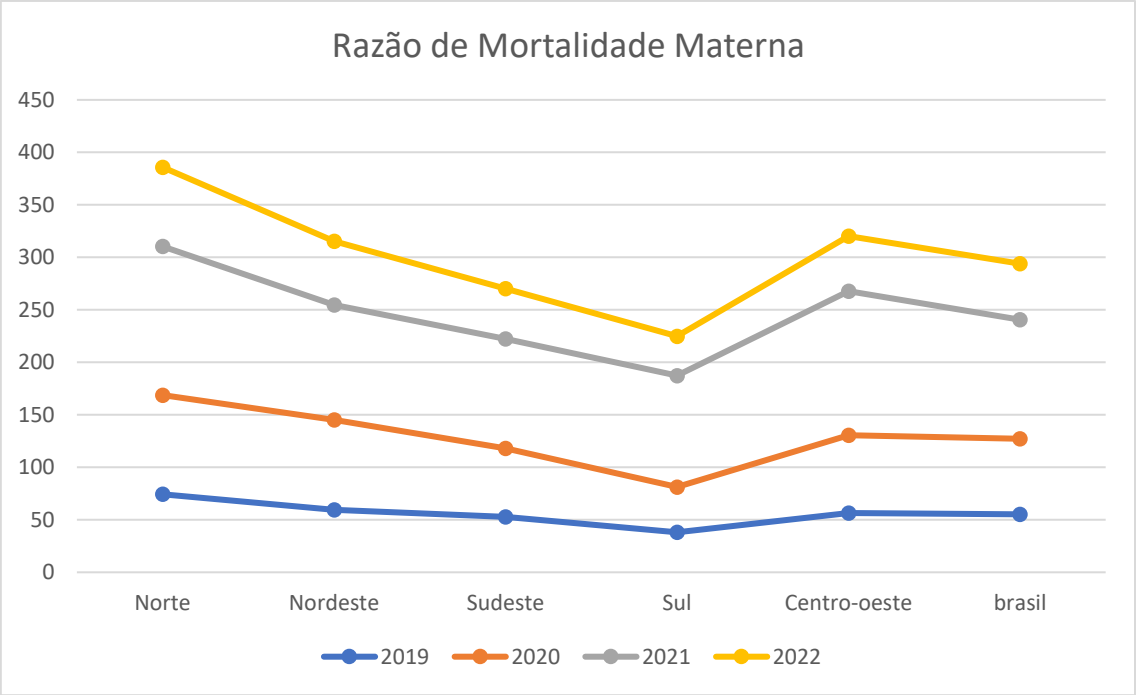
The maternal mortality ratio is a predictor of the mortality rate and operates by crossing data from SIM with Sinasc. The MMR during the pandemic period showed accentuated values, compared to 2019 and 2020, with greater emphasis on the North and Midwest regions.

Table 5. Maternal mortality ratio per 100,000 live births. Brazil and Regions. 2019 to 2022.

Region of residence	2019	2020	2021	2022
North	74,3	94,5	141,6	75,4
Northeast	59,4	85,9	109,4	60,7
Southeast	52,8	65,1	104,5	47,9
On	38,1	43,2	106,1	37,5
Central-West	56,4	74,2	137,1	52,6
Total	55,3	72,0	113,2	53,5

Source: Mortality Information System (SIM).

Figure 5. Maternal mortality ratio per 100,000 live births. Brazil and Regions. 2019 to 2022.



Source: Mortality Information System (SIM).

DISCUSSION

By analyzing the information collected in the study, a high number of maternal deaths during the covid-19 pandemic was observed, especially in 2021 compared to the previous years of 2019 and 2020, probably as a result of the pandemic. The Brazilian regions with the highest maternal deaths were the southeast and northeast regions of the country, with 1,055 and 838, respectively (Table 1).

The MMR showed significant increases with rates above 100.0, revealing an unfavorable scenario aggravated by the pandemic period. The northern region followed by the central-west region were the ones with the highest mortality rates, 94.5 and 74.2 in 2020; 141.6 and 137.1 in 2021 in the North and Central-West regions, respectively (Table 5**).** According to figure 5, the MMR was above the target set for Brazil, which is 30.0 deaths per 100,000 live births by 2030, established in the Sustainable Development Goals (SDGs).

Until 2019, direct obstetric causes had high values, but during the pandemic, indirect obstetric causes were higher, especially in 2021, which shows a probable relationship with the covid pandemic influencing maternal morbidity and mortality (Figure 2). From 2022 onwards, the values of indirect causes began to decrease, signaling a possible adherence to protective measures such as vaccination for Sars-CoV-2 (Brasil, 2024). The period of highest occurrence of maternal deaths occurred during the puerperium (up to 42 days after the end of pregnancy), reaching 1,180 and 2,029 deaths in 2020 and 2021, respectively.

During the pandemic period, women were unable to access health services to carry out prenatal, childbirth, and postpartum care, which are vital for adequate care and assistance

(Guimarães; Moreira, 2024). In addition to the difficulties in accessing services, racial differences, lack of supplies, obstetric violence, and high morbidity of covid in women, especially those with pre-existing comorbidities, evidence the unfavorable scenario aggravated as a result of the pandemic (Souza; Amorim, 2021).

In addition to the temporal context of the pandemic, the difficulty of access and functioning and structure of the Unified Health System, intrinsic, biological and immunological factors contribute to the involvement of these women by covid (Guimarães; Moreira, 2024). It is also important to note that direct obstetric causes, which are related to interventions, omissions, incorrect treatments, thus constituting preventable causes through quality care, during the period before the pandemic and after 2021 were on the rise, totaling 4,019 during the period from 2019 to 2022 compared to 3,652 indirect causes in the same year (Table 2) (Brazil, 2023).

It is important to note that regional and social inequalities have a significant impact on these numbers. The social determinants of health have a great influence on environmental behavior and interfere in population situations. Analyzing the socioeconomic status, it is inferred that the most impacted age group was 20 to 39 years, mainly 30 to 39 years, representing women of childbearing age. It is worth mentioning studies that address the influence of racial discrepancies on the maternal mortality ratio in Brazil. Black women had high MMR compared to brown and black women in all Brazilian regions, in addition to having higher probabilities of hospital admissions and progression to death (Silva et al. 2024).

It is essential to adopt public policies aimed at maternal and child well-being, which guarantee the quality of care in all areas of health. In the current context, the consequences of the pandemic on care are visible, delays in scheduling, lower adherence to prenatal care, lack of reproductive planning, lower vaccination coverage and reduction of postnatal care, which impacts the pregnancy-puerperal period and all women's health care, as it was a period of extreme instability and certainty, thus increasing mental health problems such as anxiety and depression (Souza; Amorim, 2021).

FINAL CONSIDERATIONS

The study highlighted the impact of the Covid-19 pandemic on maternal mortality in Brazil, highlighting the increase in maternal death rates, especially in the Southeast and Northeast regions. Indirect obstetric causes, related to pre-existing conditions and aggravated by pregnancy, were particularly high during the pandemic period, suggesting a direct influence of covid-19 on maternal morbidity and mortality.

Limitations in access to health services during the pandemic contributed to inadequate prenatal, delivery, and postpartum care, critical factors for the prevention of maternal complications.

Socioeconomic and regional inequalities, as well as racial differences, were determining factors in the disparity in maternal mortality rates, with black women presenting higher risks of serious complications and mortality.

The study reinforces the need for public policies aimed at reducing maternal mortality, focusing on improving access to and quality of maternal health care, and eliminating regional and racial inequalities. Adherence to protective measures, such as vaccination, is crucial for the protection of pregnant and postpartum women against Covid-19 and other associated complications.

Maternal mortality is a sensitive indicator of the health conditions and social well-being of the population. Therefore, continuous monitoring and evaluation of interventions are essential to achieve the targets set out in the Sustainable Development Goals and ensure the health and lives of women of reproductive age.

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Pharmacognostic study of *Vernonia ferruginea*, *Vernonia polyanthes* and *Vernonia westiniana species*

https://doi.org/10.56238/sevened2024.018-073

Ely Eduardo Saranz Camargo[1]

ABSTRACT

Introduction: Medicinal plants have always been a reason for discussion, the knowledge of their use dates back to past times in the history of civilization. *Vernonias* are species known as "assa-peixe", and *Vernonia polianthes*, popularly, is widely used for the treatment of various pathologies. This study aims to carry out pharmacognostic methods to identify species of *Vernonia ferrugínea*, *Vernonia polyanthes* and *Vernonia westiniana* The identification of a species becomes difficult when the plants are acquired in the form of powders, dry extract or in liquid form such as tinctures and extracts. In this way, pharmacognostic tests were carried out, facilitating the identification of the species. Methodology: Based on physical and chemical methods, described in the Brazilian Pharmacopoeia VI edition and on the website of the Brazilian Society of Pharmacognosy, some tests were carried out to identify secondary metabolites present in the species: *Vernonia ferrugínea*, *Vernonia polyanthes* and *Vernonia westiniana*. Results and Discussion: In the results obtained, chemical reactions and physical methods were found, which provided safe identification of the species studied. In the determination of the ash content, it is possible to differentiate them, being more evident through chemical methods, than through reactions, the presence of flavonoid glycosides, alkaloids, terpenes and saponnic compounds was determined. Another practical method that provided an identification of the compound 3,7dimethyl-quercetin, isolated by high performance liquid chromatography (HPLC), was the comparative thin layer chromatography (CCCD), which verified the presence in *Vernonia polyanthes* and was not found in *Vernonia westiniana*. From the same isolated substance it was possible to quantify it in methanol extracts and in the infusion, and higher concentrations were found in extracts of *Vernonia ferruginea* and lower concentrations in infusion of *Vernonia polyanthes*. Conclusion: From this pharmacognostic study, it was possible to establish a method of identification of Vernonias species, however, for better safety it is necessary to use more technologically modern methods.

Keywords: Medicinal Plant, Pharmacognostic Control, Identification, Herbal Medicines.

[1] Professor and researcher at the Faculty of Medicine of Ji-Paraná - FAMEJIPA and at the Estácio University Center of Ji-Paraná - RO

INTRODUCTION

The use of medicinal plants is as old as the history of civilization itself. Entire peoples often associated the healing power of medicinal plants with magic and religious rituals. Second, Cordeiro et al., 19961, reported in their manuscript that, even today, Western folk medicine performs rituals where they mix knowledge of the healing properties of medicinal plants with rituals and prayers to expel diseases1.

Brazil has the largest medicinal flora in the world, however, there was a period in which medicinal plants were discredited. This occurred due to the advancement of the pharmaceutical industry in the world, corroborating a new concept of medicine, often palliative2.

Currently, the use of medicinal plants is increasingly widespread, not only in Brazil, but also in other countries, especially in Europe. A few years ago, only the population of the interior, who cultivated both edible and medicinal plants, used them to cure the most diverse diseases through knowledge acquired from grandparents or great-grandparents3.

Although the Brazilian flora is recognized as one of the most important, in numerical, economic, ornamental, ecological and medicinal terms in the world, there are few works that deal with this subject4.

Some species are easily found, distributed throughout the national territory, despite this, there is a major problem in the lack of quality of plant material, which in most cases there is no reliable identification5. In magistral pharmacies, inputs, products derived from medicinal plants, are purchased in the form of tinctures or powders, which are hardly tested to assess quality and/or botanical identification6.

A species widely used in folk medicine is *Vernonia polyanthes*, mainly for the treatment of bronchitis, respiratory system disorders and, also against kidney problems7,8. It is also indicated for rebellious coughs, flu, skin conditions, muscle pain, rheumatism9. Because they have morphological similarities with two other species, *Vernonia ferruginea and Vernonia westiniana*, it is of paramount importance to carry out pharmacognostic studies to determine quality assurance, such as: comparative chromatography in thin layer, total ash, acid insoluble ash, for the confirmation of the species *Vernonia polyanthes*, often misclassified by laymen9.

METHODOLOGY

The species, *Vernonia ferruginea* , *Vernonia polyanthes* and *Vernonia westiniana,* were collected in the vicinity of São José do Rio Preto – SP, identified at the Institute of Biosciences – UNESP, in partnership with the botany department of the Educational Institution. After collection and identification, weeding was carried out and after separating the leaves and flowering sums, they were subjected to drying in an oven of circulating air at 37º C for 48 hours.

After drying, the species were sprayed and stored in plastic bags and left in stock for pharmacognostic tests. For this work, a bibliographic survey was also carried out, using articles available in the following databases: lilacs, web of science, pubmed and scielo, with the objective of knowing the secondary metabolites present in the respective species, facilitating their pharmacognostic identification. The execution of the tests was based on the methodologies described in the Brazilian Pharmacopoeia VI edition10, and on the website of the Brazilian Society of Pharmacognosy (SBF), in the link ensino11.

PHYSICAL METHODS

The determination of moisture in the powders of the species: *Vernonia ferruginea*, *Vernonia polyanthes* and *Vernonia westiniana* was based on the method described in the Brazilian Pharmacopoeia10. The characterization of the method is based on the loss due to desiccation in an oven and aims to determine the amount of volatile substances of any nature eliminated under the conditions specified in the monograph10. The quantitative determination of the total ashes was also performed according to the method described in the Brazilian Pharmacopoeia10, with a quantity of powder from each of the species being evaluated, placed in a porcelain crucible, previously desiccated and the mass recorded. The respective samples were incinerated at a temperature of 450°C, then, after cooling in a desiccant, weighing was carried out and the percentage of ash of the respective powders of the species used was calculated.

In the test to determine the moisture index, a 50mL becker was used for each of the species, in the form of powder, being left in an oven at 105º C for 6 hours, after which they were placed in a desiccator for cooling. Subsequently, the beckers were taken, with the help of tongs, the masses were individually evaluated, 1 g of each species was placed in the beckers, separately and taken to the greenhouse at 105º C for 1 hour, determining the respective masses to verify the moisture content10.

After determining the total ashes, the crucibles containing the ashes of the respective species were added to each one, certain amounts of 7% hydrochloric acid were added to each one and placed in heating for 5 minutes. After this time, they were removed from heating, left on the countertop, covered with clock glass, until cooled, and after that, the respective residues of each crucible were transferred to filter paper and sent for drying on a hot plate, After drying, they were incinerated, in crucibles, in the muffle until a constant weight in determining the concentration of the ashes insoluble in acid10.

The determination of the total flavonoid levels was carried out according to the method described in the article by Silva (2016)[12], in which aliquots of 0.5ml, in triplicate of each sample of the hydroalcoholic extracts of *Vernonia ferruginea* , *Vernonia polyanthes* and *Vernonia westiniana*, that an equal volume of methanol solution of 5% aluminum chloride (AlCl3) was added. It was

allowed to rest for 15 minutes and was read in a UV spectrophotometer (Bel Photomic) at a wavelength of 420nm. The total flavonoid content was determined using a calibration curve with quercetin, purchased on the market, at concentrations of 0, 25, 50, 75, 100 mg/ml, considering a variation of +/- 5%[12]. From the equation of the line obtained in the curve of the pattern graph, the total flavonoid content was calculated, and the results were expressed in mg of quercetin per 100g of each of the species of *Vernonia ferrugínea*, *Vernonia polyanthes* and *Vernonia westiniana*.

Comparative thin layer chromatography (CCCD) was used to identify the presence of 3,7 dimethoxy-quercetin, isolated in methanol extract of *Vernonia polyanthes* and also found in *Vernonia ferruginea*, in infusion of *Vernonia polyanthes* and *Vernonia westiniana*. The method consists of obtaining infusions of the mentioned species, applying them on a silica gel plate, separately, with the isolated substance (3,7 dimethoxy-quercetin), used as a marker.

After application of the extracts and quercetin on the plate, it was placed in a glass vat, containing BAW eluent (butanol, acetic acid and water) in the respective concentrations of 65:25:15, impregnating the tub for elution of the applied extracts. After it reached the upper line, the plate was removed from the eluent, allowed to dry for a few minutes and developed with saturated solution of ceric sulfate and resublimated iodine saturated in a glass vat.

In the quantification of the substance, 3.7 dimethyl quercetin, isolated in methanol extract of *Vernonia polyanthes*, in another work, a Waters Millipore chromatograph was used, equipped with a binary pump system model 501 Waters, UV detector (Waters model 486), Phenomenex C-18 column in reverse phase (250 x 4.60 mm, 5 µ) and mobile phase composed with methanol and water. The samples used were obtained from the extracts of *Vernonia ferrugínea* and *Vernonia polyanthes*, and in the latter, an infusion for quercetin quantification was also repaired, by construction of a calibration curve, using five different concentrations of the standard.

The quantitative analysis of 3,7 dimethyl quercetin, present in the methanol extracts of *the polyanthes and ferruginea species*, was used using the external standard method. Obtained in standard solution of the substance isolated in the methanol extract of *Vernonia polyanthes*, in the following concentrations: 2.0, 0.26, 0.035, 0.0047, 0.00063mg/mL. The sample was prepared from the MeOH extract by collecting 100mg of the extract and diluting it in 1mL of methanol. The infusion was prepared at 10% (w/v) of the dried plant in boiling distilled water until and left until cooled.

CHEMICAL METHODS

The chemical methods used in the identification of the secondary metabolites present in the species studied were based on the Brazilian Pharmacopoeia and on the website of the Brazilian Society of Pharmacognosy.

In the determination of cardiotonic glycosides, the following reactions were performed: Liebermann-Burchard reaction, pentagonal lactonic ring identification reaction: Kedde reaction and 2-deoxysugar identification reaction: Keller-Kiliani reaction. In the flavonoid compounds, the Shinoda or Cyanidine reactions, reaction with aluminum chloride, reaction with ferric chloride, reaction with sodium hydroxide, as well as in the anthraquinones, possible Borntraeger reactions were analyzed, being a microsublimation process.

In the saponin glycosides, a physical process was used that consists of agitation of the solution to detect foam formation. In the chemical process, general reactions, the Rossol reaction, the Micthell reaction, the Rosenthalen reaction, the reaction with Sulfo-vanille reagent were performed. In the specific reactions, the Liebermann-Burchard reaction was performed, reactions performed from chloroform solution. A general reaction was also performed, with trichloroacetic acid and specific Salkowski reaction.

Analysis of alkaloids, metabolite responsible for different antimicrobial activities, was performed from the sprayed plant and after extraction with dilute sulfuric acid and chloroform, it was detected with neutral lead acetate. For the determination of tannins, general reactions are observed: reaction with 2% ferric chloride, reaction with neutral lead acetate. Specific reactions with lead acetate and glacial acetic acid and reaction with ferric chloride.

RESULTS AND DISCUSSION

Pharmacognostic tests were proposed in order to identify species of *Vernonia ferrugínea*, *Vernonia polyanthes* and *Vernonia westiniana*., because they are morphologically similar and that, in magistral pharmacies, are acquired in the form of dry powder and microprocessed, or even in dry extract. Thus, it becomes difficult to identify the species, so pharmacognostic tests are of great value for this determination.

The species *Vernonia ferruginea*, despite having a large amount of flavonoids, is very similar to *Vernonia polyanthes*, therefore, to perform most of the pharmacognostic tests, the species *Vernonia polyanthes* and *Vernonia westiniana* were used, because they have similar morphological characteristics.

In the performance of the tests to determine water losses, as described in materials and methods, using the leaves and stalks of *Vernonia polyantes* and in the same way for *Vernonia westiniana,* values of desiccation losses of 8.8% and 10% were obtained, respectively. The moisture index can directly influence ash index and other tests.

In the quality control of medicinal plants, a simple, easily reproducible test that offers good security in the identification of species, and the index of total ash and acid insoluble ash. According to the analyses described in materials and methods, the result obtained clearly showed a difference in

the ash content of the two species (Table 1), while the ash content of *Vernonia polianthes* reached levels between 0.32g of total ash and 0.10g of acid-insoluble ash, the indices obtained with *Vernonia westiniana* reached values of 0.39g and 0.09g, respectively and in *Vernonia polyanthes* , values of 0.17g and 0.11g were obtained, respectively.

Thus, the ash index presents itself as a simple and fast way to differentiate between the species: *Vernonia ferruginea*, *Vernonia polyanthes* and *Vernonia westiniana.* With this result, it can be concluded that the total ash index test and acid-insoluble ash can clearly differentiate the species of Vernonias studied.

Table 1 - Total and acid-insoluble ash of *Vernonia ferriginea, Vernonia polyanthes and Vernonia westiniana.*

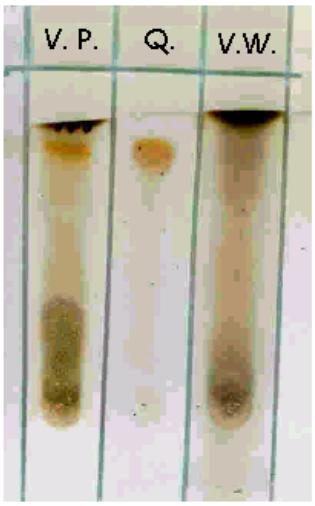
Species	**Total ash**	**Acid insoluble ash**
Vernonia polyanthes	0.32g (10.7%)	0.10g (3.33%)
It's a bit of a bit of a fun way to do it.	0.39g (13.0%)	0.09g (3.0%)
Vernonia ferruginea	0.17g (7.12%)	0.11g (3.52%)

The corresponding hydrogen potential (pH) obtained in both the infusion and the methanol extract of *Vernonia polyanthes and Vernonia westiniana* was 5.78 and 7.27, respectively. As there were no significant differences in the infusion with the methanolic extract, it can be stated that *Vernonia polyanthes* has a higher acidity index than *Vernonia westiniana.*

The use of medicinal plants is directly related to the manipulation of magisterial formulas in pharmacies, and in the vast majority of cases they are acquired in the form of powders (dried and ground), making it difficult to identify the plant macroscopically. A quick and practical method for pharmacies to identify vetal drugs is the CCCD method of methanol extract and infusion of *Vernonia polyanthes*, using the commercial standard of 3,7 dimethyl quercetin, which can be easily found in the market.

The methodology proved to be effective for the proposed test, because with the use of a specific developer for flavonoids, the presence of the substance in the extract and infusion of *Vernonia polyanthes* is clear (Figure 1), the method can still be guaranteed, since 3,7 dimethyl quercetin is not present in another similar species of the genus, studied so far.

Figure 1 – CCCD of the methanol extract of *Vernonia polyanthes and Vernonia westiniana* with a standard of 3,7 dimethyl quercetin.



V.P. – Extrato metanólico de *Vernonia polyanthes.*

Q. – Standard 3.7 dimethyl quercetin in methanol.

V.W. – Extrato methanolica of *Vernonia westiniana.*

After the isolation of the metabolite 3,7 dimethyl quercetin, in methanol extract of *Vernonia polyanthes*, taken as an external standard, it was used to quantify the presence in methanol extracts of *Vernonia polyanthes and Vernonia ferruginea species* and infusion of *Vernonia polyanthes.*

The calibration curve allows the linearity of the detector (UV-vis) to be verified within the ranges of concentrations evaluated, where a correlation index value of 0.99959 was obtained. This means that the method used in the analysis of the substance studied obeys a linear correlation in the ranges of concentrations considered.

According to data obtained in the calibration curve, from linear regression it was determined the quantification of the substance 3,7 dimethyl quercetin, present in the extracts MeOH of *Vernonia polyanthes and Vernonia ferruginea*, obtaining, respectively, the concentration of 0.13mg/mL and 0.54mg/mL in each extract and in the infusion of *Vernonia polyanthes* the concentration of 0.063mg/mL.

In determining the amount of flavonoids present in the extracts, it is a good indicator to evidence pharmacological effects, since they are considered antioxidants and anti-inflammatories and are found in most plant species. Thus, it is important to quantify this metabolite for safe and effective use of the species studied, to evidence the therapeutic activity.

The results obtained in the quantification of flavonoids, for the species: *Vernonia ferruginea*, *Vernonia polyanthes* and *Vernonia westiniana,* based on spectrophotometric methods, in the quantification of quercetin, provided percentage (w/w) of the flavonoid in each medicinal species studied. Thus, according to the results obtained in the tests, it was determined that, in *Vernonia ferriginea,* the percentage of 1.21% was assessed, for the species *Vernonia polyanthes*, the percentage value was 0.75% and in the species *Vernonia westiniana* the percentage of the presence of the flavonoid, determined from quercetin, was 0.05%, which characterizes that this species does not present significant amounts of flavonoids, shown in Table 2.

Table 2 - Percentages of total flavonoid concentrations, based on the values obtained with quercetin as a marker.

Medical plant	Flavonoid content obtained
Vernonia ferruginea	1.21% m/m
Vernonia polyanthes	0.75% m/m
Vernonia westiniana	0.05% m/m

In the determination of cardiotonic glycosides, according to the Liebermann-Burchard reaction, it showed positive results for the species *Vernonia ferruginea*, *Vernonia polyanthes* and *Vernonia westiniana,* observing a slightly reddish border ring, indicating the presence of cardenolides and bufadienolids. This reaction is characteristic of steroid and triterpenoid compounds, due to the fact that the reactant promotes dehydration and dehydrogenation of the fundamental nucleus, which results in derivatives with conjugated double bonds and, therefore, stained. For this reason, this characteristic is common in the compounds cardenolides and bufadienolides.

The determination of flavonoid glycosides, based on the Cyanidine test, is characteristic of the largest number of substances of this class, with positive results for the species: *Vernonia ferruginea* and *Vernonia polyanthes,* because according to the quantification of total flavonoids, the species *Vernonia westiniana*, did not present significant quantities in its constitution, corroborated the finding, according to the test result, of the occurrence of red coloration in the sample. The study with ferric chloride and sodium hydroxide showed negative results, and inconclusive results in the case of the reaction with aluminum chloride, because no change in the color of the reaction was observed.

In tests to determine the presence of anthraquinone derivatives, they are usually orange in color. In the tests carried out, based on the Borntraeger reaction, which should present a reddish-pink color indicating the presence of these anthraquinone derivatives, no change in color was observed. Therefore, the result for the presence of anthraquinones was negative in all species studied. In the microsublimation process, after heating in a plate under a metal ring, crystals should be presented for positive results, so the result obtained was considered negative, confirming the result of the previous reaction, with no identification of crystals in any of the species.

Another test that offers a safe identification is the determination of saponin glycosides, using the physicochemical method, which, after uninterrupted agitation of the test tubes, containing the diluted samples, for 5 seconds, the formation of foam was observed in all tubes, corroborating the indication of the presence of saponin compounds. Even after leaving the extracts to rest for 30 minutes, the foam formation remained stable in two species, *Vernonia ferruginea*, *Vernonia polyanthes,* considered positive for the reaction of Rossol, Mitchell, Rosenthalen which showed a slight reddish-brown reaction. In the species *Vernonia westiniana*, the test was negative, because the foam formed did not remain stable after 30 minutes.

In the reactions of Sulfo-vanillic and trichloroacetic acid, the results were negative for the species, as they did not present specific coloration, while in the Salkowski tests the species *Vernonia ferruginea* and *Vernonia polyanthes,* presented triterpenoidal nucleus and Liebermann-Burchard steroidal nucleus due to the staining that the samples presented, which confirms the presence of saponin compounds in the extracts.

The presence of alkaloids in the samples also evidences many of the therapeutic actions of the species studied, and the result obtained in the reaction with neutral lead acetate was positive, as it showed the formation of white precipitate in the samples of: *Vernonia ferruginea*, *Vernonia polyanthes* and *Vernonia westiniana*, which indicated the presence of alkaloids in the formation of insoluble complexes.

The tannins, present in the Vernonias species, were detected from the reaction with ferric chloride, which presented characteristic coloration, green for condensed tannins or catechic for the samples of *Vernonia ferruginea*, *Vernonia polyanthes* and *Vernonia westiniana,* indicating the presence of hydrolyzable tannins. In the test with neutral lead acetate, it showed a whitish precipitate confirming the presence of hydrolyzable tannins in the three species, as well as in the reaction with lead acetate and glacial acetic acid confirming the presence of hydrolyzed tannins.

CONCLUSION

Thus, it is concluded that the tests performed to identify the species of *Vernonia ferruginea*, *Vernonia polyanthes* and *Vernonia westiniana,* are favorable for the metabolite compounds found in the species, which corroborate the quality assurance, contributing greater safety to the magistral pharmacies that use powders for the preparation of formulations.

However, it is known that these tests are not completely conclusive, and there should be more accurate control, with isolation and identification of the compounds, by technologically modern methods and with accurate and safe results. Thus, for greater reliability of quality control, a phytochemical study of the species should be carried out.

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Alcohol and tobacco use in individuals with type 2 diabetes: Study before and during the Covid-19 pandemic

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Emilly Nascimento Pessoa Lins[1], Isabela Catarina Leão da Costa[2], Alessandro Henrique da Silva Santos[3], Queliane Gomes da Silva Carvalho[4], Belvania Ramos Ventura da Silva Cavalcanti[5] and Anna Karla de Oliveira Tito Borba[6]

ABSTRACT

Objective: To evaluate alcohol and tobacco use in individuals with type 2 diabetes mellitus before and during the COVID-19 pandemic. Method: A longitudinal study with a quantitative approach was carried out with 72 individuals with diabetes who were treated at the outpatient clinic of a public hospital in the city of Recife, Pernambuco. Sociodemographic and clinical variables and those related to alcohol and tobacco use were evaluated through interviews and telephone contact. Results: There was a twofold increase in the frequency of alcohol use of less than 1 day/week (2 vs 4) and a variation of 2 days/month (0 vs 4). In men there was an increase in the minimum and maximum dose and in women the maximum dose allowed. Approximately 50% reduced their tobacco use and 95.8% (69) of the individuals did not take at least one puff of their cigarettes. Conclusion: Individuals had their lifestyles altered, regarding the increase in the frequency of alcohol consumption and reduction in smoking when comparing before and during the pandemic period.

Keywords: Alcohol consumption, Tobacco use, Type 2 diabetes mellitus, COVID-19, Lifestyle.

[1] Nurse (UFPE). Resident in cardiology (COREMU/IMIP).
E-mail: enfemillylins@gmail.com
LATTES: http://lattes.cnpq.br/5435994516557547
ORCID: http://orcid.org/0000-0002-4782-407X
[2] Doctoral student in Nutrition (UFPE). Master in Gerontology (UFPE). Specialist in Clinical Nutrition (UFPE).
E-mail: isabela.leao@hotmail.com
LATTES: http://lattes.cnpq.br/9901161073252352
ORCID: http://orcid.org/0000-0001-5326-426X
[3] Master in Biometrics and Statistics
Applied (UFRPE/PPGBIOM).
E-mail: alessandro.ssantos@ufpe.br
LATTES: http://lattes.cnpq.br/5001622972488729
ORCID: http://orcid.org/0000-0001-5811-6450
[4] Doctoral in Nursing (PPGENF/UFC). Professor of the Nursing Course of the Nursing Department (CCS/UFPE).
E-mail: queliane.carvalho@ufpe.br
LATTES: http://lattes.cnpq.br/9411772366557379
ORCID: http://orcid.org/0000-0002-0724-5268
[5] Doctoral student in Sciences of Health – UPE. Master in Gerontology (PPGERO/UFPE). Specialist in Physiotherapy in Gerontology (COFFITO/ABRAFIGE).
Email: belvania.ventura@ufpe.br
LATTES: http://lattes.cnpq.br/6379199018207071
ORCID: http://orcid.org/0000-0003-0262-9024
[6] Nurse. Doctor in Nutrition (UFPE). Professor of the Graduate Program in Gerontology and of the Nursing Department of the Federal University of Pernambuco.
E-mail: anna.tito@ufpe.br
LATTES: http://lattes.cnpq.br/6979056438669077
ORCID: http://orcid.org/0000-0002-9385-6806

INTRODUCTION

The rapid worldwide expansion of the Coronavirus Disease 2019 (COVID-19) pandemic has led to the disruption of the daily activities of the population, due to the need for social distancing through home confinement in order to limit the spread of the disease [1]. With the arrival of the pandemic, future uncertainties and prolonged periods indoors are associated with economic and general health concerns. In this context, the emotional responses of individuals are varied, and can negatively interfere with physical and mental health. Therefore, this situation can lead the individual to practice inappropriate habits, such as smoking and drinking, in an attempt to increase emotional balance[2].

A study of 800 Chinese exposed to the Severe Acute Respiratory Syndrome (SARS) pandemic in 2003 found that 4.7% of men and 14.8% of women who drank alcohol increased their consumption one year after the pandemic. A similar result also occurred among smokers, with a 12.9% increase in smoking frequency during the pandemic when compared to the pre-SARS period. This fact suggests that the increase in alcohol and tobacco consumption may be associated with emotional distress resulting from the pandemic moment[3].

In the face of the COVID-19 pandemic, the increase in alcohol use not only increases the usual burden of diseases associated with its consumption, but also the risk of infection by the virus, since the use of alcohol, especially excessively, can interfere with the innate and acquired immune system4. Smokers are also one of the groups vulnerable to infection by the SARS-CoV-2 virus due to increased expression of angiotensin-converting enzyme 2 (ACE2), a receptor for the virus, which increases the risk of lung damage. Therefore, the association of alcohol and tobacco can lead to a worse prognosis of the individual when infected with COVID-195,2.

Type 2 Diabetes Mellitus is a serious public health problem and in the context of the COVID-19 pandemic it is an additional factor for the worsening of infection by the virus, especially in the presence of glycemic uncontrol6. It is known that there is an association between alcohol consumption and diabetes complications. Alcohol affects diet and blood glucose, that is, the liver is overloaded by deactivating the alcohol ingested, which leads to dysregulation in the appropriate amount of glucose in the blood and a higher risk of hypoglycemic episodes. Tobacco use also interferes with disease control, increases overall mortality, cardiovascular diseases and other diabetes complications, such as diabetic foot, peripheral neuropathy and renal failure7.

Living with diabetes in the COVID-19 scenario can generate varying degrees of negative emotions, such as anxiety and depression, which can lead to greater consumption of alcohol and tobacco, and thus, the emergence and worsening of the disease's complications8. In addition, the lack of glycemic control can contribute to the worsening of COVID-19 infection in this population.

The aim of this study was to evaluate alcohol and tobacco use in individuals with type 2 diabetes mellitus before and during the COVID-19 pandemic.

METHODS

This is a longitudinal study with a quantitative approach, carried out at the Endocrinology Outpatient Clinic of a public hospital in the city of Recife, Pernambuco, northeastern Brazil.

The population consisted of individuals with a medical diagnosis of type 2 diabetes mellitus in their health records and assisted by the service. To determine the sample size, the sample calculation equation was used for the study of proportion in a finite population9, considering a confidence level of 95%, test power of 90%, and the expected proportions for changes in alcohol and tobacco consumption during the pandemic, the sample accounted for the necessary sample size of 69 individuals with diabetes. However, of the total sample population in the pre-pandemic period (86), 14 were excluded due to the lack of a telephone number, resulting in the final sample of 72 individuals.

Individuals with communication and/or cognition impairment, recorded in the health record, that could interfere with data collection during the follow-up of the study, were excluded; presence of chronic complications in advanced stages, such as hemodialysis, amaurosis, sequelae of stroke or heart failure, previous amputations, or active ulcer in the lower limbs.

Data for the period prior to the COVID-19 pandemic were collected in person at the diabetes outpatient clinic from July 2019 to March 2020, by a previously trained research team. Thus, for this study, this information was retrieved and the database was constructed. For data on alcohol and tobacco use during the COVID-19 pandemic, a form was built via Google Forms, for application via telephone contact, using the WhatsApp tool, during the period from January to March 2021. The telephone call was previously scheduled, respecting the most convenient day and time for the participant, who was instructed to look for a calm and silent environment in order not to interfere with the understanding of the questions that made up the collection instrument.

Alcohol use was investigated based on questions about alcohol consumption (yes/no), frequency, intake in the last 30 days of at least 1 dose ≤for women and ≤2 doses for men, and at most (≥4 doses for women and ≥ 5 doses for men). The dose of alcoholic beverage was considered as 360 ml of beer or 150 ml of wine or 45 ml of distilled beverage7.

Smoking was assessed using the three items of the Questionnaire of Activities of

Diabetes Self-Care Questionnaire (QAD), a version of the Summary of Diabetes Self-Care Activities Questionnaire (SDSCA) was translated, adapted and validated for use in Brazil, showing good internal consistency, with inter-item correlation, measured by Cronbach's alpha, of 0.86.

Smoking was codified considering the proportion of smokers, the mean number of cigarettes smoked, and the last time they smoked10.

The data were entered into an electronic spreadsheet of the Excel program for Windows®, in double entry, verified with VALIDATE, a module of the Epi-info Program version 6.04 (WHO/CDC/Atlanta, GE, USA), to check consistency and validation. Next, the data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 18.0. Continuous variables were tested for normality of distribution using the Kolmogorov-Smirnov test. Data with normal distribution were described as mean and standard deviation (SD), while non-normal data were described as median and interquartile range (IQR). In the description of the proportions, the binomial distribution was approximated to the normal distribution by the 95% confidence interval.

The study was submitted to and approved by the Research Ethics Committee under CAAE registration: 12615619.0.0000.5208. It should be noted that it complied with the requirements recommended by Resolution 466/2012 of the National Health Council, in which participants were invited to participate in the research by signing the free and informed consent form.

RESULTS

Of the 86 individuals with diabetes, most are women (74.4%), under 60 years of age (52.3%), minimum age of 26 years, maximum of 80 years and average of 58.50 (SD±10.04) years, live with a partner (54.7%), complete elementary school (59.2%), monthly income less than or equal to one minimum wage (58.5%), with an average of 1378.4 reais (SD±1116.8). Regarding the clinical variables, most of them have been diagnosed with diabetes for more than 10 years (55.8%), with complications of the disease (66.3%) and refer to arterial hypertension (91.4%) as an associated prevalent comorbidity (Table 1).

Table 1. Sociodemographic and clinical characterization of individuals with diabetes assisted in an outpatient service. Recife-PE, Brazil, 2019-2020.

Variables	N	%
Gender		
Male	22	25,6
Female	64	74,4
Age (years)		
< 60	45	52,3
≥ 60	41	47,7
Years of study		
≤ 8 ≤	45	59,2

> 8	31	40,8
Monthly Income (SM)		
Up to 1	48	58,5
More than 1	34	41,5
Family Starter		
With partner	47	54,7
No companion	39	45,3
Time of Diagnosis (years) 10 ≤	38	44,2
> 10	48	55,8
Comorbidities		
Yes	70	81,4
No	16	18,6
Hypertension		
Yes	64	91,4
No	6	8,6
Dislipidemias		
Yes	33	47,1
No	37	52,9
Obesity		
Yes	22	31,4
No	48	68,6
Complications of DM		
Yes	57	66,3
No	29	33,7

When analyzing alcohol consumption before and during the COVID-19 pandemic, it is observed that use decreased, but there was a two-fold increase in frequency of less than 1 day/week (2 *vs* 4). Regarding the days of the month where this occurred, the variation in the increase in alcohol use from 1 to 7 days per month is observed, being higher in 2 days/month (0 *vs* 4). In men, there was an increase in the minimum and maximum dose of alcohol, and in women, only the maximum dose allowed (1vs2) (Table 2).

Tobacco use decreased by approximately 50%, with daily and occasional consumption being more prevalent. Consumption in the last seven days reveals that 95.8% (69) of the individuals did not

take at least one puff on their cigarettes. However, among those who stated consumption, there was a 50% reduction in the pandemic period (6vs3). Glycated hemoglobin values were above the recommended values for glycemic control before and during the pandemic, but showed a reduction of 0.33% in the pandemic period (Table 2).

Table 2. Alcohol and tobacco use before and during the COVID-19 pandemic by individuals with diabetes assisted in an outpatient service. Recife-PE, 2019-2020.

	BEFORE		**DURING**	
Variables	**N**	**%**	**N**	**%**
Alcohol use				
Yes	16	18,6	11	15,3
No	70	81,4	61	84,7
Frequency of alcohol use*				
1-2 days/week	3	18,8	2	18,2
3-4 days/week	1	6,3	-	-
<1 day/week	2	12,5	4	36,4
<1 day/month	10	62,5	5	45,5
Use of 2 doses of alcohol per men in the last 30 days*				
Yes	3	50,0	6	85,7
No	3	50,0	1	14,3
Use of 1 dose of alcohol per women in the last 30 days*				
Yes	4	66,7	4	100,0
No	2	33,3	-	-
Use of 5 doses of alcohol per men in the last 30 days*				
Yes	2	33,3	3	42,9
No	4	66,7	4	57,1
Use of 4 doses of alcohol per women in the last 30 days*				
Yes	1	11,1	2	50,0

No	8	88,9	2	50,0
Days of the month this occurred (days/month)*				
1	1	25,0	3	30,0
2	-	-	4	40,0
3	1	25,0	1	10,0
4	1	25,0	-	-
5	1	25,0	-	-
6	-	-	1	10,0
≥7	-	-	1	10,0
Tobacco use				
Yes, daily	4	4,7	2	2,8
Sim, occasionally (≤	2	2,3	1	1,4
daily)				
Former smoker	25	29,1	24	33,3
Never smoked	55	64,0	45	62,5
Use of 1 cigarette - even if				
Just one puff in the last 7 Days*				
Yes	6	7,0	3	4,2
No	80	93,0	69	95,8
Median	2,0 (IQ 2,0; 2,0)		2,0 (IQ 2,0; 2,0)	
If yes, number of cigarettes/day*				
4	3	50,0	-	-
5	-	-	1	50,0
6	1	16,7	-	-
10	1	16,7	-	-
12	-	-	1	50,0
20	1	16,7	-	-
Mean ± Standard Deviation	8.00 ± 6.32		8.50 ± 4.95	
Use of the last cigarette				
Never smoked	53	61,6	46	63,9
>2 years	27	31,4	26,7	31,9

4 to 12 months ago	-	-	1	1,4
In the last month	1	1,2	-	-
Today	5	5,8	2	2,8
Glycated hemoglobin (%)* ≤7%	21	30,0	9	29,0
> 7%	49	70,0	22	71,0
Mean ± Standard Deviation	8.64±2.45		8.31±2.34	
Glicemia de Jejum				
Median	145,0 (IQ 106.1; 218.4)		125,5 (IQ 97.5; 188.7)	

Notes: *Included only individuals with diabetes who self-reported alcohol and/or tobacco use.

DISCUSSION

The present study evaluated alcohol and tobacco consumption before and during the COVID-19 pandemic in people with type 2 diabetes mellitus, in order to investigate possible changes in the behavior of individuals.

The COVID-19 pandemic has generated unemployment and reduced working hours, which has led to a decrease in income for a large part of the population, which can result in tighter budgets, which can favor the use of alcohol and tobacco, with the worst prognosis for individuals with type 2 diabetes mellitus, infected with COVID-1911-13.

The increase in alcohol consumption can occur in periods of stress, such as the experience of the pandemic associated with uncertainties about the future, social isolation, and the social restrictions imposed by COVID-19, contributing to the worsening of health-related behaviors14. Daily alcohol intake for adults with diabetes should be limited to ≤1 drink for women and ≤2 drinks for men. Considering a dose of 150 ml of wine (a glass), 360 ml of beer (a small can) or 45 ml of spirits (a dose with a standard dispenser), measuring the equivalent of 15g, on average, of ethanol [7].

Although most participants decreased their alcohol intake, there was an increase in the frequency of alcohol use, which allows significant impacts on glycemic levels, since it contributes to the occurrence of hypoglycemic episodes. Depending on the sensitivity of each individual and the complications of the disease, the masking of hypoglycemic symptoms, reduced hepatic glucose production, and increased production of ketone bodies may occur, with a risk of worsening the hypoglycemic condition[7]. Associated with this, alcohol consumption can also destabilize the immune system and reduce the ability to fight bacterial and viral infectious diseases, such as COVID-19, increasing the risk of infection during the pandemic15,16.

In China, 32% of habitual alcohol consumers reported increased alcohol use, and 19.7% reported relapse to alcohol abuse during the pandemic17. This consumption was pointed out as a result of increased anxiety, stress, depression, and reduced mental well-being18,19. Like alcohol, the consumption of cigarettes by people with diabetes also negatively influences the control of the disease, and can be considered an antecedent factor for the development of peripheral arterial disease, such as peripheral neuropathy20-22.

Tobacco use is related to decreased sensitivity in the lower limbs. The substance present in cigarettes, nicotine, triggers adrenergic responses that increase blood glucose levels and interrupt insulin production, in addition to causing vasospasm that increases the possibility of thrombosis and can cause peripheral vascular insufficiency23,24. The prevalence of neuropathy is twice as high in current smokers (33%), compared to nonsmokers (15%) and former smokers (17%)[25]. When analyzing tobacco consumption, the present study reveals that approximately half of the individuals reduced their use during the pandemic period, a result that contrasts with that of a health survey by Fiocruz, in which it showed that most smokers are not reducing their cigarette consumption26. This contrast occurs because the pattern of behavior is changeable according to the way of coping and the social conditions of each individual15.

Another explanatory factor for this reduction in smoking is the knowledge of the worsening development of COVID-19 infection, since the substances and inhaled smoke cause damage and weakness to lung function11. Such pathophysiological changes, when advanced, lead to pulmonary involvement associated with acute respiratory syndrome caused by the Coronavirus27.

The predisposition to worsening of the COVID-19 condition in individuals with diabetes mellitus is due to the increased risk of developing a state of metabolic inflammation that stimulates an increased release of cytokines28,29, and also due to their compromised immune system, reducing the body's ability to fight infection, impairing the healing process and prolonging recovery30.

Therefore, further studies with a larger sample are needed in order to investigate the incidence of this increase in alcohol consumption to also assist in decision-making in the context of public health and public policies. It is essential that governments and civil entities in the field of health adopt strategies to present to the population about the harm associated with the consumption of this substance.

Among the limitations of the study, the fact that the survey was collected through telephone interviews, not reaching the entire population sample collected before the COVID-19 pandemic, since not everyone has access to the internet and has changed their cell phone number. In addition, the fact that the questions are self-reported may be subject to recall bias. In addition, the fact that data collection was 1 year after the beginning of the pandemic may be subject to conjunctural changes throughout the temporal evolution of the pandemic.

CONCLUSIONS

People with diabetes mellitus had their lifestyles changed, with regard to the increase in the frequency of alcohol consumption and reduction of smoking, before and during the pandemic period. It is observed that the use of alcohol decreased, but there was a doubling increase in frequency, and a reduction in tobacco use during the pandemic.

Associated with the use of alcohol and tobacco is the highest risk of hypoglycemia, the study population presents dysregulation in the adequate amount of glucose in the blood, so they have worse glycemic control.

Thus, there is a need to build health interventions that consider the particularities, characteristics and limitations of the groups to receive the intervention, so that it is possible to contribute with positive results in the cessation of alcohol and tobacco use, and in the glycemic control of individuals with diabetes, given the potential negative effects associated with health. even greater when aligned with COVID-19.

CONTRIBUTIONS

All authors contributed equally to the conception of the research project, data collection, analysis and discussion, as well as to the writing and critical review of the content with intellectual contribution and the approval of the final version of the study.

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CONFLICT OF INTEREST

There was no conflict of interest.

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Case report – Distal tracheal injury after orotracheal intubation

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Mylena Phillipps Cunha[1], Ana Carolina Graciano[2], Gabriela Machado Guther[3], Priscila Gabriella Carraro Merlos[4] and Fernando Merlos[5]

ABSTRACT

Distal tracheal lesions resulting from orotracheal intubation are rare and more severe complications, which mainly affect females. Its cause is not specified, but it is believed to be related to direct laceration of the trachea. Thus, its diagnosis is based on the clinical symptoms observed in the patient and, for confirmation, bronchoscopy is used. Its treatment depends on the size of the lesion, for the choice of the surgical or conservative method, and should occur early. However, the site of the injury also influences the choice and effectiveness of treatment, i.e., in cases of distal tracheal injury, conservative treatment becomes impaired due to the impossibility of positioning the cuff of the orotracheal tube after the injury. Thus, the present case report aims to report and discuss the treatment of a case of distal tracheal injury after orotracheal intubation. In addition, the scarcity of journals that address this subject shows the importance of further studies focused on the treatment of distal lesions, due to the greater complexity of this case.

Keywords: Intratracheal Intubation, Trachea, Trauma.

[1] Medical Student
Estácio IDOMED College of Jaraguá do Sul
E-mail: mylenaphcunha@hotmail.com
[2] Medical Student
Estácio IDOMED College of Jaraguá do Sul
E-mail: anacarolina_graciano@hotmail.com
[3] Biomedical Postgraduate in Hospital Auditing
Hospital Regional Hans Dietter Schmidt
E-mail: gabrielamachadog@gmail.com
[4] Medical Infectious Disease Specialist (CRM 17290/RQE 12590)
Hospital Regional Hans Dietter Schmidt
E-mail: pricararo@hotmail.com
[5] Intensive Care Physician (CRM 21056/RQE 14440)
Hospital Regional Hans Dietter Schmidt
E-mail: drfmerlos@gmail.com

INTRODUCTION

Tracheal lesions are rare and serious complications resulting from orotracheal intubation (OTI), estimated to occur in 0.005% in intubations with simple lumen and 0.05% in intubations with double lumen. (FENIL et al., 2018; SCHNEIDER et al., 2007). It occurs predominantly in females, about 85.7%, related to the presence of a smaller airway. In addition, the form of treatment chosen was surgical in 61% of the cases and resulting in a mortality of 22% (FENIL et al., 2018; MINÃMBRES et al., 2009).

From this, it can be seen that traumatic tracheal injury does not have a specific cause that is proven in the literature, the main origin of this pathology would be the direct laceration of the trachea generated by the end of the orotracheal tube when it is inserted. The presence of some risk factors may be related to tracheomalacia, stenosis, size and stiffness of the orotracheal tube, in addition to the professional's knowledge of the intubation technique (FENILI, et al., 2018).

Thus, its diagnosis is based on clinical suspicion, through signs and symptoms, such as respiratory failure, subcutaneous emphysema, hemoptysis, and pneumothorax. To confirm the diagnosis, bronchoscopy is used, which will reveal the location and size of the lesion. Finally, the treatment of choice in most cases has been urgent surgical repair, although some authors advocate conservative treatment, always taking into account the injury and the patient's condition (MIÑAMBRES; BURÓN; BALLESTEROS; LLORCA; MUÑOZ; GONZÁLEZ-CASTRO, 2009). This study aims to report and discuss a case of distal tracheal injury after orotracheal intubation, emphasizing the site and treatment of this type of injury.

CASE REPORT

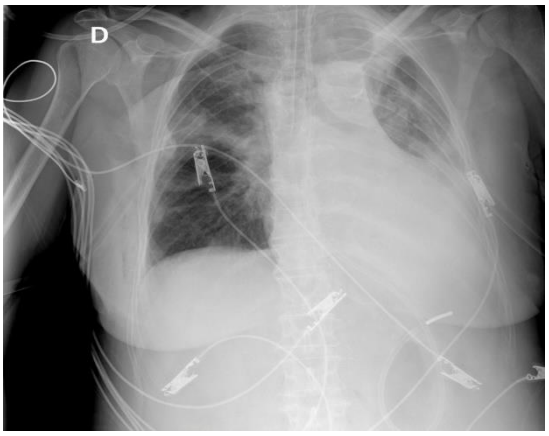
Female patient, 65 years old (DN 04/22/1957), previously with Chronic Obstructive Pulmonary Disease Gold C, Arterial hypertension, Type 2 diabetes mellitus, Ischemic stroke for 20 years without sequelae, PAOD with previous angioplasty for 3 years, non-dialysis chronic kidney disease (CKD EPI 55.2), totally independent previously.

The patient sought the emergency room (ER) due to dyspnea for 5 days, with sudden worsening for 12 hours after the use of a cleaning product. Taken to the ER by family members due to a lowered level of consciousness 10 minutes ago. Orotracheal intubation was performed and vasoactive drug was required, maximum dose of 0.3mcg/kg/min. The patient was transferred to the ICU, where, in less than 24 hours, she developed bilateral subcutaneous emphysema and neck associated with worsening ventilation and increased ventilatory parameters.

A chest x-ray was performed, which showed pneumomediastinum, and the thoracic surgery team chose to perform bilateral chest drainage and fiberoptic scopy. Fiberoptic scopy showed a tracheal lesion immediately anterior to the carina of approximately 4.0 (four) cm. Selective right-

sided OTI was chosen in the first 24 hours located immediately below the tracheal injury, with the objective of clinical stability and continuous sedation (with Midazolam and Fentanyl) and the use of a continuous neuromuscular blocker. Antibiotic therapy (Ampicillin and Sulbactam) was also introduced to cover the germs of the tracheobronchial tree.

Figure 1-Raio-X of tórax



Selective chest x-ray located in the right source bronchus with pneumomediastinum associated with left pulmonary atelectasis

Figure 2- Fibrobronchoscopy



Fiberoptic bronchoscopy with pneumomediastinum compatible with the site of the visualized lesion

Due to the impossibility, after 24 hours of selective IOT, the cuff was repositioned, keeping it at the site of the injury, continuing the conservative treatment. The patient evolved with a difficulty in adjusting ventilatory parameters on the mechanical ventilator, at this point the team thought about performing an intubation with a Carlens tube, but due to the site of the injury, this treatment is impossible. In addition, surgical treatment was also considered, but due to the patient's instability and the use of high-dose vasoactive drugs, making it impossible to remove them due to the risk of CRA,

it was not possible to perform surgical treatment. As a result of persistent hypoxia, the patient progresses with worsening shock, characterizing refractory shock, making it impossible to treat at the moment.

In the next five days, the conservative approach was maintained with attempts at hemodynamic stability, the patient did not respond to the measurements and maintained refractory shock. On the fifth day of hospitalization, the patient developed significant bradycardia, in addition to QRS enlargement, with partial improvement after the use of adrenaline and atropine. However, at 8:55 p.m., the patient progressed with new bradycardia and, soon after, cardiorespiratory arrest (CA) in asystole, without response to clinical measures and massage, progressing to death at 9:07 p.m.

DISCUSSION

Tracheal injury is a rare condition that requires treatment as early as possible so as to offer a better condition for the patient. In the case reported here, it is clear that the lesion occurred in the distal part of the trachea, anterior to the carina, which makes treatment difficult, since it is not possible to insert a cuff from the orotracheal tube below the lesion, which would be the most indicated form.

Regarding the treatment indicated for cases of tracheal injury, when a laceration of less than 2cm is observed, the patient presents few symptoms, which do not evolve over time and practically without loss of air to breathing, the choice of treatment is conservative. In addition, when the patient has a laceration greater than 4cm, with lesions involving carina or esophagus, it is necessary to perform a surgical procedure. And in those in which the laceration is between 2 and 4 cm, there is still no consensus on how to act, and it is up to the physician to choose the most appropriate technique (FIORELLI et al., 2017).

Concomitantly, there are reports about considering treatment through minimally invasive surgeries, seeking to have a lower patient morbidity rate. In lacerations located in the distal trachea, the best option for entry would be through a right thoracotomy. Thus, a study showed that a procedure option for a tracheal injury with more than 5cm in the distal part was a video-assisted endotracheal suture through a cervical incision (COSTA JÚNIOR et al., 2012)

Thus, at the moment after traumatic injury to the trachea, it should be ensured that the airway remains patent, avoiding increased patient morbidity. Thus, the development of other pathologies may occur, such as pneumomediastinum, which needs to be repaired at the site where air leakage is occurring, and subcutaneous emphysema, which can affect various parts of the body (PEREIRA et al., 2011). As a result, these two pathologies were visualized in the patient, thus increasing her risk of morbidity.

In addition, authors argue that patients who have, in addition to tracheal injury, pneumomediastinum, cutaneous emphysema and who need mechanical ventilation, it would be better to undergo treatment with a surgical procedure. The surgical option for distal tracheal involvement would be right thoracotomy (COSTA JÚNIOR et al., 2012; CARBOGNANO et al., 2004).

In parallel to this, another study addressed the report of a patient with a lesion in the distal third of the trachea of approximately 3 (three) cm in size, where a surgical approach was performed, by means of a thoracoscopy and after a right posterolateral thoracotomy. And at the end, the trachea was dissected to suture the tracheal lesion, completely closing it (FENILI et al., 2018). Thus, it is verified that the patient in the present study could have benefited from the surgical treatment when compared to the conservative treatment.

In this sense, in relation to the aforementioned patient, a conservative treatment was chosen, seeking to position the cuff of the orotracheal tube below the lesion, but due to the lesion being in the precarina, in the distal trachea, it was not possible to position the cuff properly. Thus, this patient became unviable, and later evolved to a CA, progressing to death. Despite this, surgical correction should also be performed in the presence of signs of mediastinitis or any sign of ventilatory instability (MEDINA et al., 2009). Therefore, it is verified that it would have an indication for surgical treatment, however it was contraindicated due to hemodynamic instability.

Finally, when correlating with the literature, it is observed that lesions up to 4 cm do not exist a consensus on the best treatment to be performed, and it is up to the physician to make this choice, which was conservative treatment. However, due to the location of the lesion and its respective impossibility of properly positioning the cuff together with ventilatory instability, when correlating with studies, the best treatment to be performed would be surgery. However, due to the hemodynamic instability that the patient presented, it was considered by the surgical team that it was not possible to perform surgical treatment and that the procedure would increase mortality. However, the non-performance of surgery generated friction between the ICU and surgical teams, as the ICU team considered that if they did not operate, the outcome would be death, which, in the end, was what happened.

CONCLUSION

The present study aims to increase the discussion about clinical or surgical treatment in cases of distal tracheal injury after orotracheal intubation and to correlate the treatment performed with the literature. In the case reported here, conservative treatment was chosen due to hemodynamic and ventilatory instability, which makes it impossible to remove the patient, thus preventing surgical treatment by the surgical team. However, an unfavorable outcome was observed, but studies show that in the case of distal involvement together with respiratory instability, a better option could be

surgical treatment, i.e., it is believed that perhaps if surgical treatment occurred early, before instability or even in hemodynamically unstable patients, the patient could have a better outcome. However, there are still few studies that focus on the site of tracheal injury with its respective treatment, thus highlighting the need for further studies on the subject, aiming at the most effective treatment.

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Case report: Alcoholic fatty liver associated with low alcohol intake

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Aline Lourdes Pasqualli[1], Raphaela Lorrana Rodrigues Araújo Cabral[2], Priscila Gabriella Carraro Merlos[3] and Fernando Merlos[4]

ABSTRACT

Alcoholic liver disease is common in patients with increased alcohol intake, as a result of which liver damage and injury occurs that can impair proper functioning and metabolization in the liver. The objective of this study is to present the case of a female patient who developed alcoholic fatty liver disease, but with low alcohol intake. The patient presented laboratory and imaging tests with significant alterations, and some hypotheses were raised for differential diagnoses, following the investigation, a biopsy was performed with a favorable result for alcoholic hepatic steatosis. Thus, it is of great importance to recognize that females reach higher alcohol concentrations when compared to males, in addition to having a hormonal issue involved.

Keywords: Hepatic Steatosis, Liver, Female.

[1] Medical Student
Estácio-IDOMED College of Jaraguá do Sul
[2] Medical Doctor, Centro Universitário São Lucas
Resident of internal medicine - Hospital Municipal São José
[3] Infectious Disease Specialist with a postgraduate degree in health management and a postgraduate degree in hospital infection
Hospital Regional Hand Dieter Schmidt
[4] Intensive Care Physician with a postgraduate degree in intensive care and health management
Hospital Regional Hans Dieter Schmidt

INTRODUCTION

Alcoholic liver disease is a consequence of excessive alcohol consumption that is directly linked to damage to the body, the liver participates in alcoholic oxidation, characterized by first-pass metabolism is the organ most susceptible to injury[1]. It performs several functions, including regulation of cholesterol and coagulation factors, production of proteins and enzymes, metabolic functions and detoxification[2].

Men can ingest a greater amount of alcohol when compared to women, it is known that around 20% of men who consume amounts greater than 80 g of ethanol and women about 20 g of ethanol daily, for a period of more than 10 years have a greater chance of developing liver cirrhosis[2].

Chronic alcohol use is considered in men who consume amounts greater than 40 grams/day, while for women more than 20 g daily is needed to be considered individuals with chronic use of alcoholic beverages. Alcoholic liver disease occurs in about 20% of patients considered alcoholics, who abuse it[3].

The present article aims to report the case of a young patient diagnosed with alcoholic hepatic steatosis associated with low alcohol intake, which in most patients requires increased consumption of alcoholic beverages to develop the disease. In view of this, it is important to know that even in young patients with a history of low alcohol intake, cases of steatosis may occur, advising and warning that even young patients should moderate the use of alcohol and take care of their health, as cases of steatosis may evolve in the future to hepatitis, cirrhosis and even cancer.

CASE REPORT

A 35-year-old female was referred to the emergency room after presenting hemoglobin of 3.5 in an external laboratory test. The patient had already been under investigation for anemic and weight loss for more than 1 year. He reported a history of recent hospitalization requiring 4 CHADS and the presence of long-term hemorrhoidal disease. At the time of admission, she reported asthenia, adynamia and jaundice that had started about two weeks earlier, in addition to laboratory tests with altered hemoglobin. On physical examination, the patient presented jaundiced, tense abdomen, no pain on palpation, but the presence of a palpable liver, suggesting hepatomegaly, no signs of ascites and peritonitis, and perimalleolar edema in the lower limbs showed progression of improvement. The patient was then submitted to laboratory and imaging tests that showed negative serology, bilirubin of 10, enlarged PAT of 1.8, LDH 325, TGP of 34, AST 155, GGT 1074 and FA 281 abdominal tomography corroborated hepatomegaly and hepatic fat deposition, upper digestive endoscopy with presence of moderate pangastritis and colonoscopy with findings of cecum colitis, without major particularities in the exams presented. In addition, following the investigation, peritoneal fluid was collected, which was negative for neoplastic cells, doppler of hepatic vessels and transvaginal USG,

all within normal standards. In view of this, the possibility of a possible autoimmune hepatitis/cholangitis was raised, and markers and liver biopsy were requested. Finally, liver biopsy showed a large extent of alcoholic fatty liver disease. However, the patient reported low alcohol intake, denied psychiatric events such as anorexia or bulimia, which make the case of hepatic steatosis with low alcohol intake.

DISCUSSION

The human body is able to metabolize the alcohol consumed in order to avoid accumulations and serious health dysfunctions, so there are several steps with the objective of degrading this substance through enzymes. After ingestion, it undergoes first-pass metabolism, usually in the gastric mucosa by alcohol dehydrogenase. A large amount of alcohol is absorbed through the intestinal route, traveling through the bloodstream until it reaches the liver through the portal system, being metabolized mainly in the hepatic route4.

Genetic factors are involved in the pathogenesis of alcoholic liver disease. The variety of enzymes responsible for chemical reactions that act on ethanol and acetaldehyde (AA) are directly linked to the emergence of dependence. Some genes implicated, especially those of alcohol dehydrogenase, play a lower metabolization of ethanol, favoring the pathway that generates metabolites that are aggressive to the liver. In addition, different forms of aldehyde dehydrogenase are related to greater sensitivity to alcohol in women and Asian peoples. Orientals who have dysfunction of ALDH2, an enzyme, are more likely to have liver damage. Thus, the patient in the aforementioned case presents the female gender as a possible coadjuvant for a greater predisposition to harmful effects of alcohol, which configures that women are more prone to liver damage[2].

Women may develop the disease in lower amounts than men and have worse prognosis. By ingesting the same amount of alcohol that males consume, they reach higher concentrations in the bloodstream, mainly because they have less body mass, less body water, causing less alcohol distribution. Estrogen actively participates by increasing intestinal permeability to endotoxins with greater expression of CD14 receptors, stimulating pro-inflammatory cytokines[2].

Females are especially vulnerable when compared to males with regard to liver damage involved in alcohol consumption. This can be explained by the fact that female first-pass metabolism is decreasing and has lower activity of cytoplasmic alcohol dehydrogenase of hepatocytes, an enzyme involved in metabolization. In addition, estrogen increases the risk of female liver damage and higher levels of ethanol in the systemic and portal circulation are also expected [3,5]. The patient in the study fits into this context because she is a woman and has higher levels of circulating estrogen, mainly because she is in a young, reproductive age group, as mentioned, there are greater chances of

hepatic harmful effects, which corroborates the above, as the young woman opened the clinical picture with alcoholic hepatic steatosis.

Patients present with characteristic laboratory abnormalities that draw attention to possible diseases. As for hepatic steatosis, there is a significant increase in aminotransferases, especially an AST/SGT ratio greater than 3, indicating a factor suggestive of alcoholic liver disease, especially in those who do not have cirrhosis. When performing laboratory analysis of the patient, she presented a level higher than 3, corroborating the AST/AST ratio and a possible diagnosis of alcoholic hepatic steatosis[2].

CONCLUSION

The article brings a relevant theme, mainly due to the harmful effects of alcohol and because it is legally inserted in society and more and more young people come into contact with alcoholic beverages. The present study demonstrates that even small amounts and low alcohol intake can be harmful, which calls attention to greater health care. Therefore, the research becomes a means of alerting young people who believe that alcohol will not cause a problem, because the intake is low, so the article brings clinical and scientific data that even low doses can lead to liver problems, alerting to be careful with the consumption of alcoholic beverages.

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Hanok: Architectural and Cultural Aspects of the Korean Traditional House

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Maria Daniela Donoso[1]

ABSTRACT

This article seeks to approach Korean culture through the description and critical analysis of the house in hanok architecture, in addition to highlighting its technical-constructive and cultural aspects. Hanok is the term used to refer to buildings in the traditional Korean style. These had their main features crucially developed during the Joseon Dynasty (1392 -1897). Then, a critical analysis of the residential design typologies that make up this culture is developed. From these reflections, the repercussions of these architectural traditions and their contributions to the present day of this culture are also analyzed.

Keywords: Oriental Architecture, Domestic Architecture, Tradition, Historic Houses, Culture.

[1] Graduated in Architecture and Urbanism from the School of Architecture and Design of the Federal University of Minas Gerais (UFMG). Specialist in Environmental Comfort, Energy Efficiency and Sustainable Construction Technologies from the School of Architecture and Design at UFMG.

INTRODUCTION

Hanok is the term used to refer to a house built in the traditional Korean architectural style, however, in a broader sense, it also includes all types of traditional Korean architecture, such as palaces and temples (RESTREPO, 2014). According to Article 2 of the Architecture Law, signed by the Department of Architectural Planning of the Ministry of Land, Infrastructure and Transport of South Korea, *hanok* means a building whose main structure consists of wooden columns, which features Korean-style beams and roof frames, and which reflects the traditional style of Korea (SOUTH KOREA, 2014). Also according to this article, the "architectural style in *hanok*" corresponds to any building that applies the hanok form and structure simultaneously, and can also make use of modern materials and technologies (SOUTH KOREA, 2014).

The architectural features of the traditional Korean house are directly related to Neo-Confucianism, adopted as a state ideology in the first centuries of the Joseon Dynasty (KRZYSZTOFIK, 2020). Existing between the years 1392 and 1897, the Joseon Dynasty was established on the Korean Peninsula by General Yi Seong-gye. Because it was founded with the support of Neo-Confucian scholars, the Joseon Dynasty legitimized Neo-Confucianism as its official ideology (JEON, 2016). After being adopted by the entire Korean population in their daily lives, the ideology also began to strongly influence the design and organization of residences (KRZYSZTOFIK, 2020).

Due to this and other cultural factors, the issue of spatiality and experience in Korean architecture is quite distinct from Western architecture (KRZYSZTOFIK, 2020). For Confucianism and Taoism, protagonism is not given by human reason, but by the reason of nature, a situation that is deeply reflected in Korean architecture (JUNG, 2019; RESTREPO, 2014).

In addition to cultural factors, geographical and climatic aspects have also shaped Korea's traditional architectural style (AHN, 2014). The relief of the Korean Peninsula is characterized by being predominantly mountainous, which explains a specific organization for the villages, with houses distributed at different elevations and facing different directions (KRZYSZTOFIK, 2020). The climate, on the other hand, is defined as temperate, with the four seasons well defined and with a notable climatic difference between the regions (AHN, 2014). These characteristics have given rise to the development of very specific architectural solutions, which combine elements that meet the four seasons of the year (KRZYSZTOFIK, 2020). An example corresponds to *the ondol* and its derivatives, which, according to Jeon (2016), is the most striking characteristic that differentiates Korean houses from those of other countries (AHN, 2014; RESTREPO, 2014).

Created around the twelfth century, the *ondol* is a floor heating system consisting of underground conductors connected to an oven and corresponds to a unique feature of traditional Korean houses, since it is not found in any traditional architecture of another country (JEON, 2016).

Also according to Jeon (2016), it is possible to categorize the history of the Korean house into before and after the invention of *the ondol*, since this system played a significant role in the spatial *layout* and in the formation of units of Korean houses.

Hanok residences were commonly found in South Korean cities until the 1960s and 1970s. However, these were quickly replaced by large apartment complexes and factories, as a result of the sudden process of industrialization and urban expansion that marked the second half of the twentieth century in South Korea (CHO, 2021). Especially from the 1980s onwards, the policies of reurbanization of the "old" areas of large urban centers led to the demolition of traditional single-storey houses to make way for multi-storey residential and commercial buildings (RESTREPO, 2014). As a consequence, the *hanok* house represents a small percentage of residential buildings today and is mainly relegated to rural areas due to the little space available in large cities (RESTREPO, 2014).

On the other hand, due to the growing popularization and appreciation of South Korean culture, the interest in its unique residential tradition, and the search for a healthy and environmentally friendly environment, the demand for *hanok* residences has resurfaced in South Korea recently, in a junction of traditional and contemporary (KWON; AHN, 2021).

Based on these considerations, this article aims to approach traditional Korean culture through the description and critical analysis of hanok architecture residences. To this end, it was sought to present some values present in Korean culture such as Confucianism and Taoism, which are reflected in the domestic environment, as well as to describe the Korean vernacular residential space, with special emphasis on the one existing during the Joseon Dynasty. In addition, it sought to highlight the special consideration of the *hanok* for the natural environment and, thus, the regional variations and the materials and techniques used for the conception of this distinct architecture are exposed and investigated.

PHILOSOPHICAL CONCEPTS OF *HANOK*

Harmony and the relationship with the environment are highly valued by traditional Korean architecture and this is due to the fact that it has Taoist and Neo-Confucian influences (HAN, 2013). The teachings of Lao Tze, founder of philosophical Taoism, can be seen in the construction process of some architectural works, which do not consider nature as an obstacle, but rather as a kind of guide for constructions (RESTREPO, 2014).

Neo-Confucianism emphasizes the idea that man and nature are one, so according to this philosophy, architecture, a human product, must have a technology that respects the laws of nature (KIM, 1999). In addition, Neo-Confucianism emphasizes the spirit of modesty and restraint of the human being in relation to all spaces and natural resources, which means valuing respect and

coexistence with nature (KIM, 1999). The design of a *hanok* house must create a relationship with the surrounding natural environment, and in this way, traditional Korean culture applies the *pungsu* method, known in Chinese as *feng shui in its architecture* (JEON, 2016).

Pungsu or *feng shui* was developed in China about three thousand years ago and brought to the Korean Peninsula by the Chinese (HAN, 2013). This complex body of knowledge is based on an understanding that nature is responsible for helping to balance the energetic forces of environments in order to ensure good health and prosperity for its inhabitants (HAN, 2013). Thus, such a method aims to harmonize built structures with the natural environment (ZLATARITS, 2018). The mountain and rivers are the main elements of *pungsu*, since it was considered that mountains are necessary for the circulation of wind, while rivers represent a source of water (KIM, 1999).

According to the theory of *pungsu*, nature corresponds to a world of abundant energy, known as *ki*, which constantly moves and changes (KIM, 1999). In this conception, the flow of *ki* means the movement of energy from the sky, the earth and humans, something considered healthy in an environment (HAN, 2013). Building on land with an adequate configuration of mountains and rivers was thus considered the most favorable means of harnessing the energy of nature. A place with an abundance of ki was considered ideal for human settlement, since this energy would flow to the inhabitants (KIM, 1999). In this context, *pungsu* guided the arrangement of a house on the land, as well as determined its *layout* by clarifying the ideal orientation of each room for better use of natural ventilation and sunlight (ZLATARITS, 2018).

SPATIAL ELEMENTS OF THE KOREAN HOUSE IN THE JOSEON DYNASTY AND ITS REGIONALIZATIONS

The architectural features of the *hanok* are directly related to the traditional social order in Korea developed during the Joseon Dynasty in line with the ideology of the state (KRZYSZTOFIK, 2020). The Joseon Dynasty was established in 1392 on the Korean Peninsula by General Yi Seong-gye, who would later be named Taejo, the first king of Joseon. Yi Seong-gye received the support of official Neo-Confucian scholars to found the new dynasty, and so Joseon adhered to a new system based on Neo-Confucian ideals (CHOI, 2007). Although Neo-Confucianism was admitted as a state ideology in the early years of the Joseon Dynasty, it was only in the fifteenth and sixteenth centuries that the doctrine was adopted by the entire Korean population in their daily lives (JEON, 2016). This fact is due to the influences of the content of a work entitled Rituals of the Family of Zui Xi (Zhuzi Jiali), written by the Chinese philosopher Zhu Xi (JEON, 2016).

Zhu Xi's work describes proper conduct within the family according to the philosophies of Neo-Confucianism, where human relationships and the obligations of the different strata of society should be strictly defined (KRZYSZTOFIK, 2020). Family rituals were introduced to reinforce and

maintain the patriarchal system of Korean society, where clans played a key role (KRZYSZTOFIK, 2020). Residential architecture has also been influenced and adapted to the profound changes in Korea's social life (KRZYSZTOFIK, 2020).

Choi (2007) highlights three major changes that Neo-Confucianism brought about in Korean society in the Joseon Dynasty and, in turn, in the characteristics of the residences built in this period. The first change is the development of the extended family system, where several generations descended from the same patriarch live together (CHOI, 2007). In this system, the family, and not the individual, emerged as the basic unit of society, in addition to the fact that the central relationship, characterized by authority, obedience and respect, was not between husband and wife, but between parents and children (PARK, CHO 1995). In this way, primogeniture influenced the spatial arrangement of the house, in which the room intended for the eldest son was arranged next to the room of the head of the family (CHOI, 2007).

The second change in architecture induced by Neo-Confucianism highlighted by Choi (2007) refers to the emergence of pavilions dedicated to the ancestors of the family in the residences. These pavilions correspond to environments closely linked to Confucian philosophy and culture, which has filial piety as a precept, that is, the virtue of respect for parents and ancestors (ZLATARITS, 2018). Based on the content of Zui Xi's Family Rituals, the state encouraged that the residences, both of the elite and of members of the lower classes, have a space dedicated to the memory and worship of the family's ancestors (KRZYSZTOFIK, 2020).

Choi (2007) also points out that the third change caused by Neo-Confucianism in Korean society is the strict separation between feminine and masculine, which reflected profoundly on the organization of the residential space. Neo-Confucian doctrine emphasized the difference between genders, which was rooted in patriarchy (PARK, CHO, 1995). In this way, women occupied an inferior status in society, being restricted to the private sphere and subject to the authority of the father, husband or eldest son (ZLATARITS, 2018). In the residential sphere, women had their rooms separated from men or, in the case of upper-class houses, there were differentiated buildings for men and women, along with their respective dependencies (CHOI, 2007)

The spatial structure of a *hanok*, whether composed of one or several buildings, corresponded to a kitchen and compartments based on *the ondol* and *the maru*, which refer to two unique floor systems of Korean architecture (SHON, 2011). The *ondol* is a floor heating system used as a solution for winter (JEON, 2016). Traditionally in this system, hot smoke from a fireplace, located in the kitchen or outdoors, flowed into ducts under the floor, heated it, and finally exited through a chimney (SHON, 2011). The floor of rooms with *ripple* was made of stone and clay and covered with several layers of paper greased with oil (SHON, 2011).

The ondol *floor* not only brought changes in the spatial composition of the room, but also influenced the general and spatial characteristics of the house (JEON, 2016). For example, the rooms that contained *ondol* and the kitchen were usually located close together, because, to save fuel, a single fire was used both to heat the *ondol* and to cook for the family (JEON, 2016). Maru, on the other hand , refers to a system of floors of thin wooden planks arranged in an elevated position and was generally used in lobbies or semi-open rooms (CHO, 2013). The elevated position of *the maru* allowed ventilation and cooling of the room, so it was a comfort solution for the summer (ZLATARITS, 2018).

A difference between the traditional Korean residence of the Joseon Dynasty and Western residences is the issue of the use of rooms. The room is translated as *bang* in Korean. Both the western room and the *bang* correspond to unitary spaces of architecture, but there is a clear distinction between both (JUNG, 2019). Western-style rooms have a delimited function, such as dining, studying, living, or sleeping. On the other hand, *hanok dwellings* did not have room differentiation in terms of their use, that is, the *bang* did not have a fixed function. The only differentiation that the rooms of the *hanok house* received was in relation to their occupant and their position within the building (JUNG, 2019). For example, the *anbang* corresponded to the internal compartment used by the family wife, the *geoneonbang* named the room opposite the *anbang,* and the *sarangbang* was the compartment used by the head of the family (JUNG, 2019).

Unlike the Western room, the compartments of the traditional Korean house did not have a fixed use, being characterized as multipurpose spaces where various activities were carried out by the residents. These compartments could have both *maru* and *wavel* floors, systems referring to the character of the space, not to the functional space for a specific purpose (JUNG, 2019). In the *hanok* residence, only the kitchen and the storage room could distinguish the functions, however, the traditional Korean kitchen is a multipurpose space, as it was cooked, food was stored and the heating of the house was controlled (JUNG, 2019).

The use of a *bang* in the domestic space in the Joseon Dynasty as a multipurpose space is deeply related to the Korean lifestyle of the period (KWON; AHN, 2021). In the Western house, each daily activity is performed in a specific room. In the traditional Korean residential space, domestic life was mostly carried out in the *bang*: in a single room the resident slept, had meals, studied or received guests (JUNG, 2019).

Hanok houses did not have a *design layout* that was equally distributed throughout the Korean Peninsula, and variations occurred according to the region and the social condition of the family that inhabited the residence (JEON, 2016). Residences of different social classes had rooms founded on *the ondol* and *the maru*, although there were functional differences when comparing hanok layouts *belonging to members of high or low purchasing power (ZLATARITS, 2018).*

During most of the Joseon Dynasty, the Korean Peninsula was divided into eight provinces (Figure 02). Each province developed its housing plan according to the average annual temperature difference between the geographic regions (AHN, 2014). In addition, the *layout* of the house varied according to the preference of its owner, as well as the technique used by the builder (LEE, 2018).

FIGURE 01- Map of Korean provinces during most of the Joseon Dynasty (1392-1910)



Source: The author..

The four most common models of residential floor plans corresponded to linear, L-shaped, U-shaped, and rectangular shapes, with each floor plan designed for different proposals that met various climatic and environmental situations (LEE, 2018). Jeon (2016) proposes that the residential varieties found on the Korean Peninsula during the Joseon dynasty were divided into twelve areas, which did not necessarily follow the official provincial divisions. In the north of the peninsula are Hamgyeong, Pyeongan and Hwanghae. In the central portion are present Andong, Yeongdong and the Central Region. The south is comprised of Honam, Hoseo, the Southeast Coast, and Yeongnam. The islands of Ulleungdo and Jeju have developed different building traditions, so they can be considered a different category.

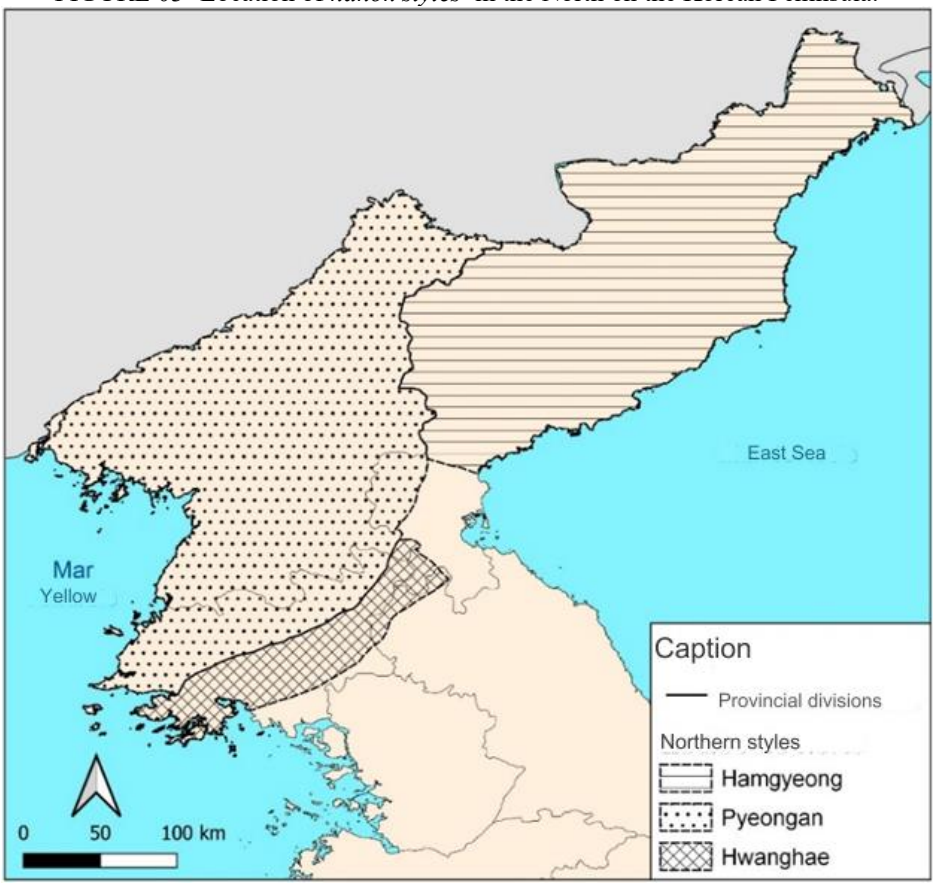
FIGURE 02- Korean Peninsula in the Joseon Dynasty and divisions by residential typologies.



Source: The author.

In the northern portion of the Korean Peninsula, which today comprises North Korea, rectangular typologies predominated, created from the arrangement of rooms in two rows, or linear, with the rooms arranged side by side in a single row. Considering that rectangular typologies are larger and incorporate more rooms than U- or L-shaped houses, it can be seen that the internal space of the residences further north of the peninsula was larger compared to houses in other regions. In addition, due to the fact that the north of the Korean Peninsula has a colder climate, *hanoks* built in this portion did not have rooms with *maru* floors, whose function corresponds to cooling the environment, a strategy considered unnecessary for such a region.

FIGURE 03- Location of *hanok styles* in the North on the Korean Peninsula.



Source: The author.

Hamgyeong-style residences, found primarily in the province of the same name, were characterized by a rectangular shape with rooms organized in a compact way, as this way the internal spaces were kept warm and protected from cold winds. The bedrooms and kitchen were arranged around a transitional room that usually served as a living space for residents, called *jeongjugan*. This space functioned as an open living area where residents usually ate meals or performed household chores. Because it has a heated floor with the *ondol system*, the *jeongjugan* was occupied for a long time by residents on cold days.

FIGURE 04- Hamgyeong-style house plans

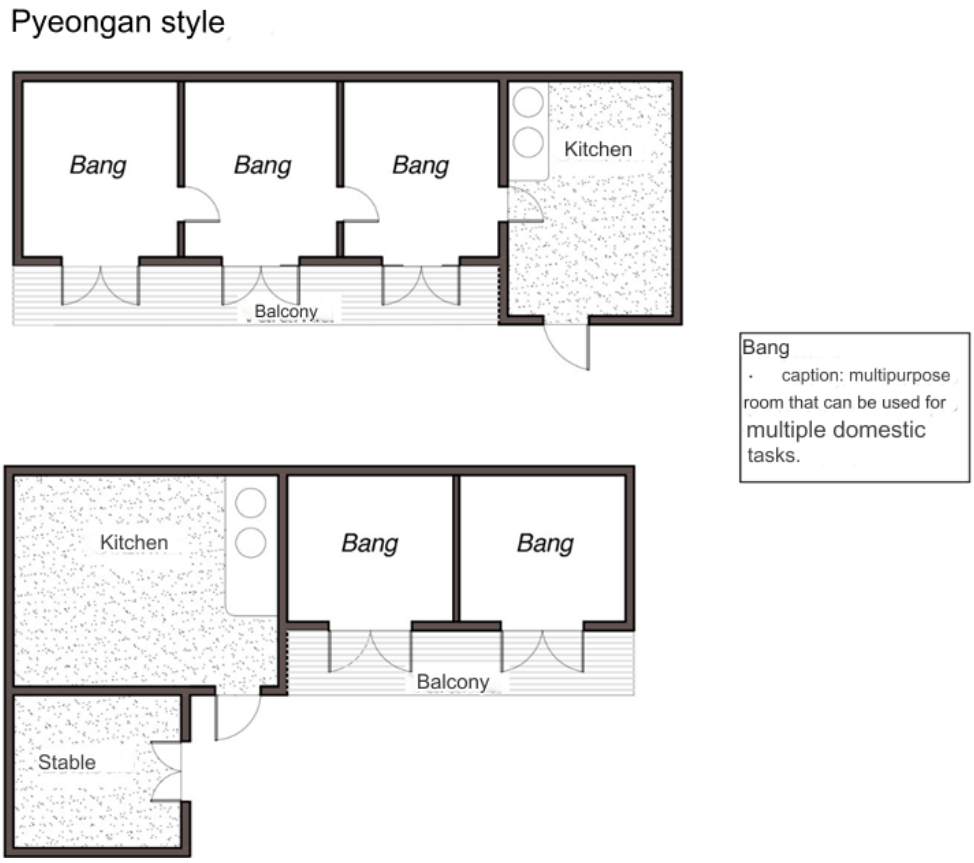


Source: The author. (adapted from SHON, 2011; JEON, 2016; ZLATARITS, 2018)

The northwestern portion of Korea, especially the province of Pyeongan, had as its main residential typology the Pyeongan style, characterized by a linear arrangement. The most simplified arrangement found in this region of the peninsula featured a kitchen at the far end of the residence

and two or three compartments arranged side by side. In many cases, the residences contained an attached stable. The villas also featured a narrow front porch with wooden floors.

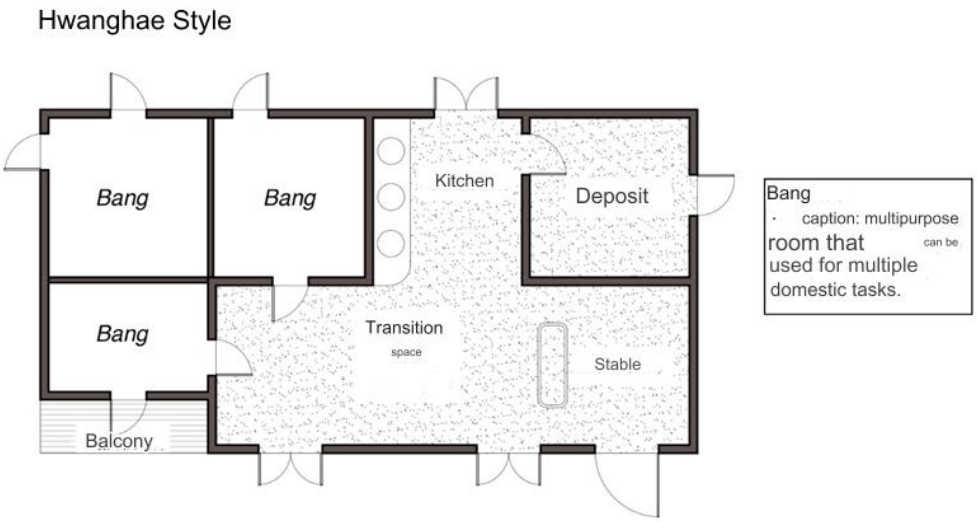
FIGURE 05- Pyeongan style house plans



Source: The author. (adapted from SHON, 2011; JEON, 2016)

The Hwanghae style, present mainly in the province of the same name, had a spatial arrangement similar to the Hamgyeong typology, with the rooms adjacent to each other. However, unlike this one, it did not contain a *jeongjugan*, but rather a front transitional space between the compartments and the kitchen. In this space, the residents of the residence carried out domestic work on rainy days or in winter. Possibly to optimize such tasks, the animals were kept in an environment right at the entrance, with the kitchen attached to it at the back.

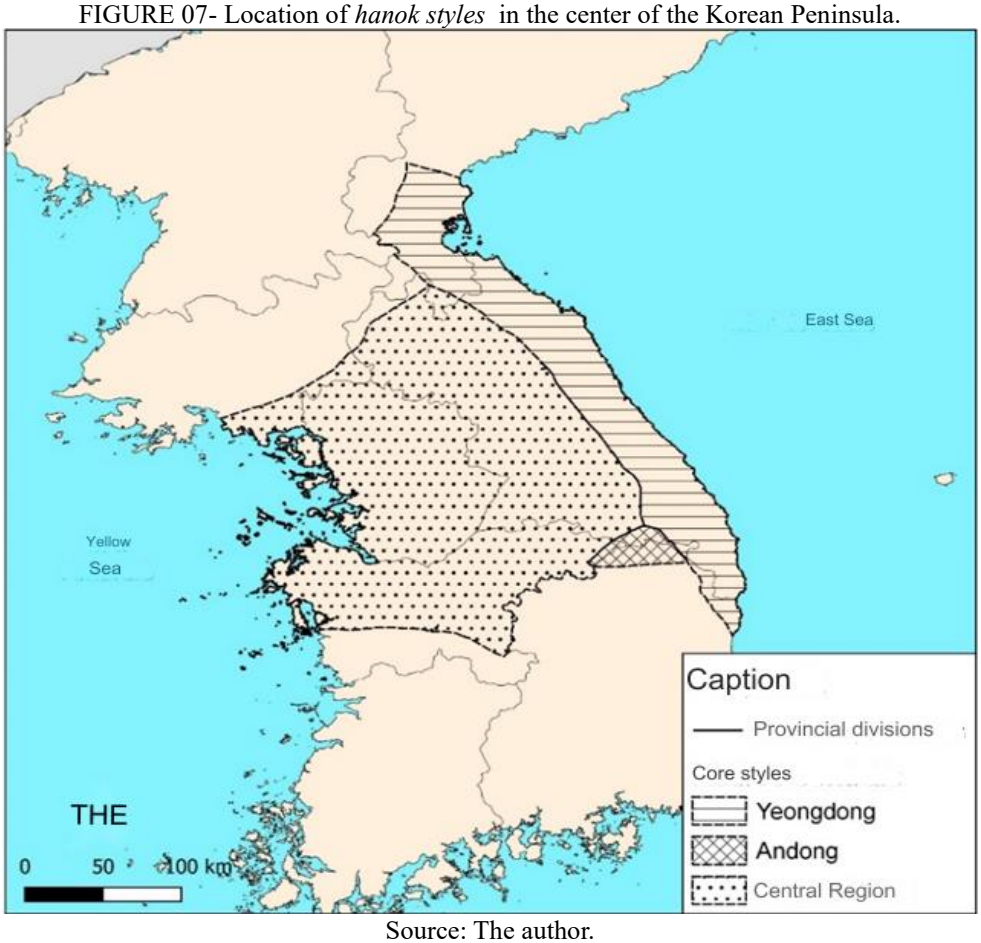
FIGURE 06- Hwanghae style house plan



Source: The author. (adapted from JEON, 2016)

In the central portion of the Korean Peninsula, the common typology for dwellings was "L" shaped, although dwellings with a U-shaped or rectangle-shaped plan were also in existence. It can be said that the typologies of central provinces corresponded to a combination of the styles existing in both the north and south of the peninsula.

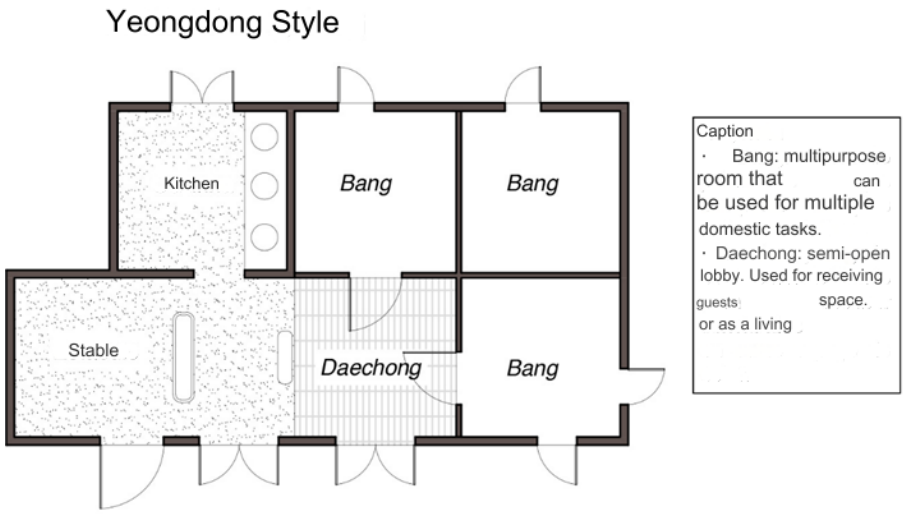
FIGURE 07- Location of *hanok styles* in the center of the Korean Peninsula.



Source: The author.

Yeongdong-style residences were prevalent in much of the east coast of the Korean Peninsula. These residences had a semi-open lobby, with *maru* floors, surrounded by rooms on its three sides. This environment, called *daecheong,* was mainly used in the summer to receive guests or as a living space for residents.

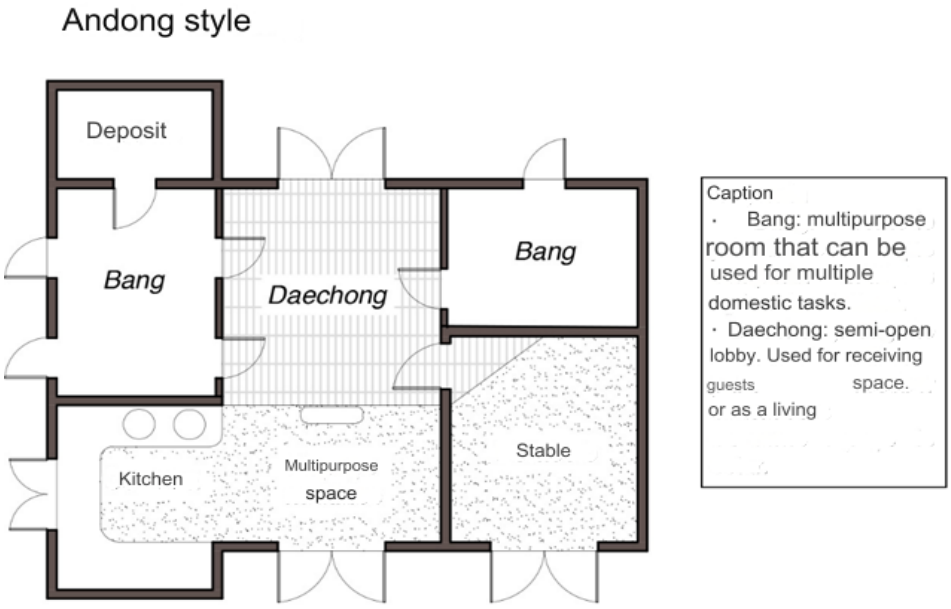
FIGURE 08- Yeongdong style house plan



Source: The author. (adapted from JEON, 2016)

The Andong style, very similar to the Yeongdong style, predominated in a small region in the interior of the peninsula. It was also characterized by the presence of rooms surrounding the three sides of a semi-open lobby. The kitchen featured an adjacent multipurpose space, where household chores were performed.

FIGURE 09- Andong style house plan



Source: The author. (adapted from JEON, 2016)

Residences in the Central Region of the peninsula usually had an "L" shape. *Hanoks* in this portion of Korea had the semi-open lobby, or *daecheong*, as an important bioclimatic strategy, considering that this space helped in ventilation and in the control of natural lighting in the building. The rooms of the residence were preferably connected by the side walls, while the front and back walls had openings in order to remain unobstructed to the external space. By creating an entrance at the front of the room and windows at the back, air circulation and natural lighting were improved, a formation that suits the mild climate of this portion of the Korean Peninsula.

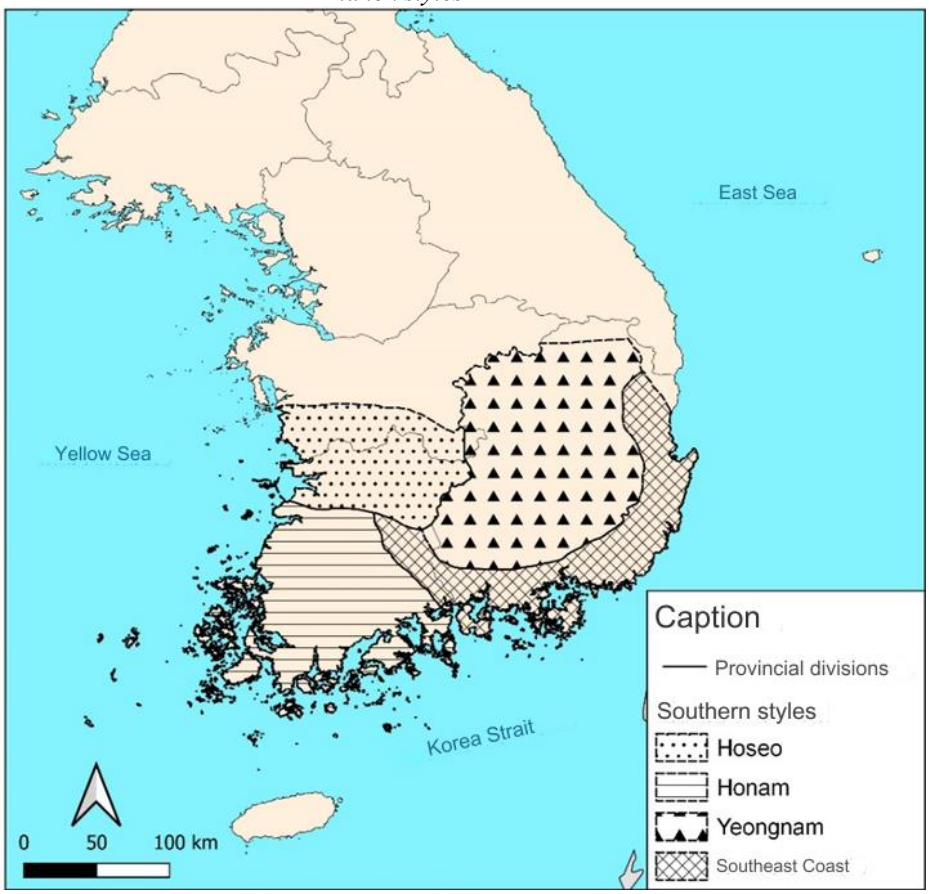
Figure 10: Floor plans of Central Region style residences



Source: The author. (adapted from SHON, 2011; JEON, 2016; ZLATARITS, 2018)

The south of the Korean Peninsula, currently located in South Korea, has a warmer and more humid climate, with a mild and prolonged summer, which requires a configuration that ensures good ventilation in the building. The residential format considered most suitable for this purpose corresponds to the linear. For this reason, the residences in this region usually had the rooms arranged linearly. Compared to the other formats used in Korean dwellings in the Joseon Dynasty, the linear styles of the southern portion of the territory were more compact and had more openings, a solution that allows greater ventilation and natural lighting. Another distinguishing feature of the residences in the southern portion of the Korean territory was the possibility of openings on the four sides of the building.

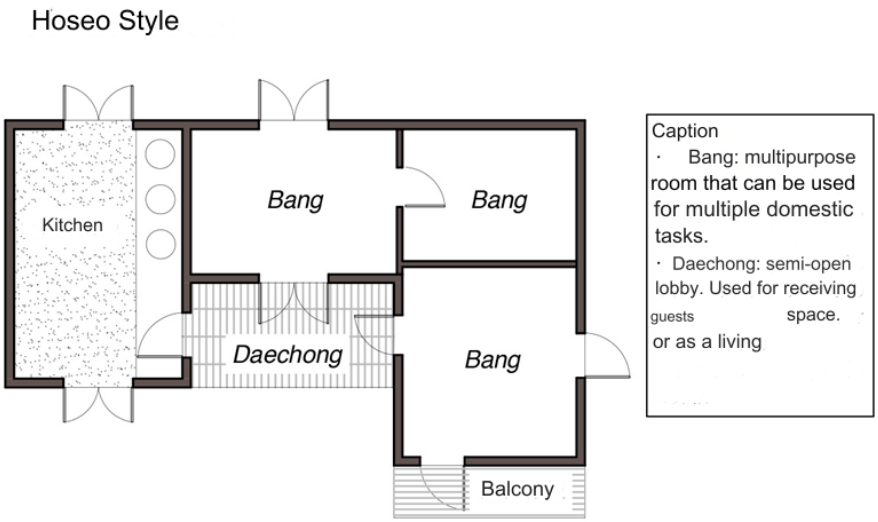
FIGURE 11: Location of *hanok styles* in the south of the Korean Peninsula



Source: The author.

The Hoseo style, the most prominent in the southwest of the Korean Peninsula, has its *layout* as a result of the population growth suffered by the region in the nineteenth century.

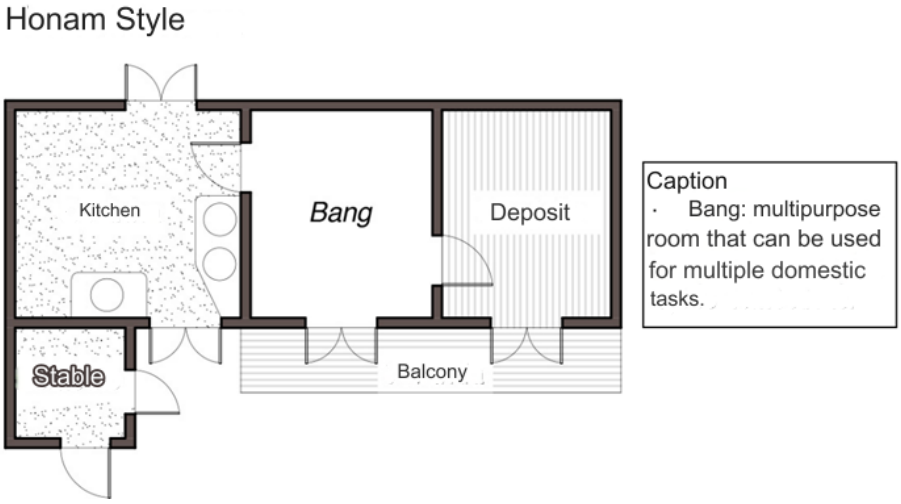
FIGURE 12- Hoseo style house plan



Source: The author. (adapted from JEON, 2016; ZLATARITS, 2018)

In most of the province of Jeolla, the Honam style predominated. This was characterized by being linear, but could also be added to its ends according to demand, just like the Hoseo style. Unlike the other styles of southern Korea, the Honam style generally did not contain rooms with *maru floors*.

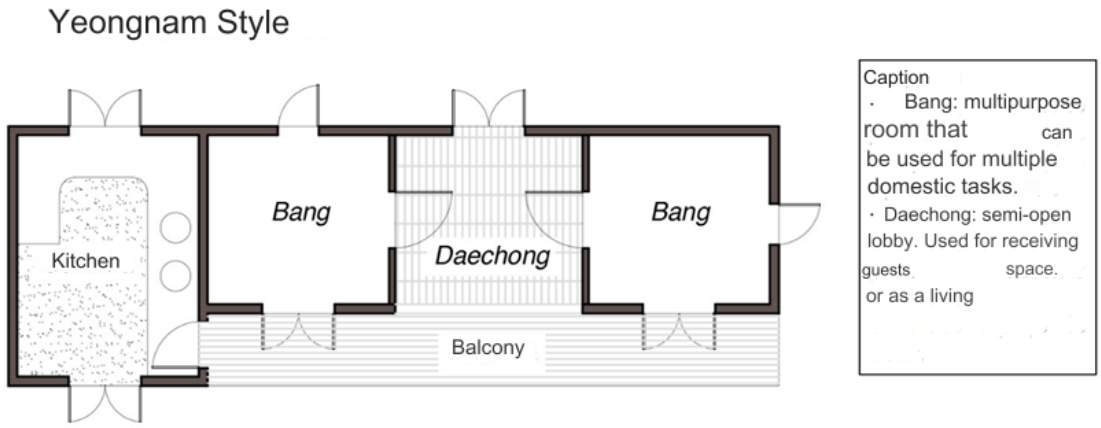
FIGURE 13- Honam style house plan



Source: The author. (adapted from JEON, 2016)

The Yeongnam style was characterized by a linear format, with the kitchen positioned at the west end of the residence. Next to the kitchen, the residents' compartments (bang) were positioned, usually separated by a semi-open lobby (*daechong*) with *maru floors*. The way in which the room with *maru* was positioned between two compartments, as found in this style, shows a milder climate that does not demand so much heat conservation.

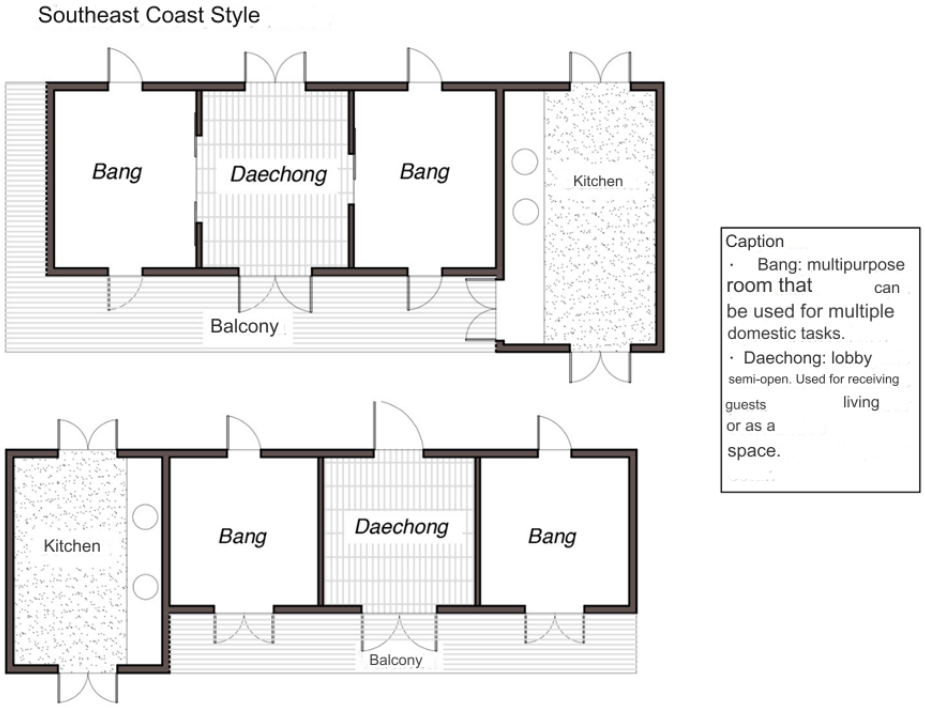
FIGURE 14- Yeongnam style house plan



Source: The author. (adapted from JEON, 2016)

Both Southeast Coast style *layouts* of the Korean Peninsula were characterized by being similar to the Yeongnam style, featuring a linear shape, a kitchen at the end, and a semi-open lobby (*daechong*) with *maru* flooring between two multipurpose compartments (*bang*). It is suggested that this arrangement of rooms also did not need consideration for harsh winters. The spaces of the Southeast Coast style were also characterized by being connected by a narrow and long wooden balcony.

FIGURE 15: Southeast Coast style house plans

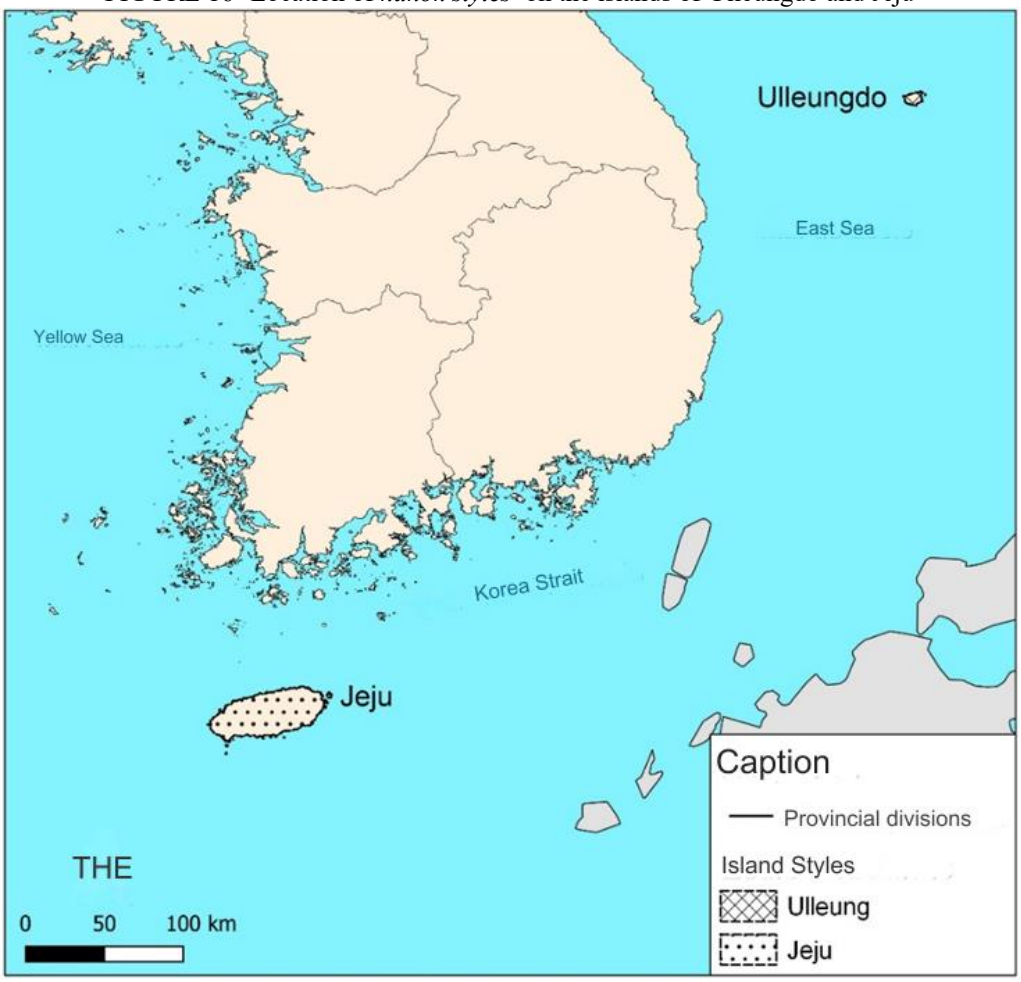


Source: The author. (adapted from JEON, 2016; ZLATARITS, 2018)

The islands of Ulleungdo and Jeju, currently belonging to South Korea, have a different climate and topography from the rest of the Korean territory, which has resulted in forms of unique

dwellings. These islands do not experience dry seasons: summer is characterized by being hot and humid, while winter is marked by weak sunlight and frequent rain, as in the case of Jeju, or snow, as in the case of Ulleungdo. These attributes made Ulleungdo and Jeju have unique residential typologies during the Joseon Dynasty.

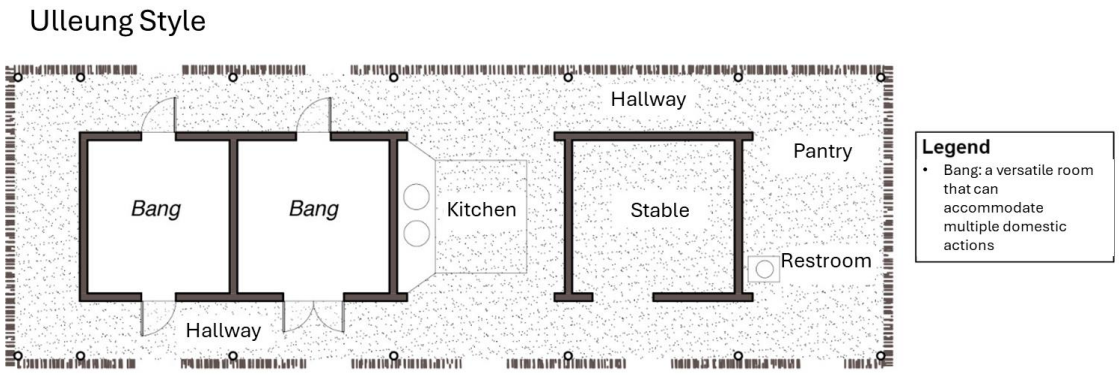
FIGURE 16- Location of *hanok styles* on the islands of Ulleungdo and Jeju



Source: The author.

The Ulleung style, present on Ulleungdo Island, had a linear format, suitable for the local climate, in addition to which subordinate spaces, such as barns and sheds, were connected to the main building. Possibly, the biggest differential of Ulleung-style residences corresponds to the presence of an autonomous wall installed under the eaves of the building that had the function of protecting against snow and cold winds. This wall was conceived through the weaving of corn husk and a local kind of grass and attached to the wooden columns that delimited the exterior of the building (JEON, 2016). The walls of the main building, on the other hand, were characterized by having a structure of logs stacked parallel to the ground, capable of sustaining greater loads (JEON, 2016). This set proved to be efficient in withstanding the high amount of snow in winter, as well as bringing comfort to residents during this season.

FIGURE 17- Ulleung style house plan



Source: The author. (adapted from ZLATARITS, 2018)

The Jeju style, predominant on the homonymous island, had as its main differential aspect the material used for the design of the residences. Walls and fences were designed with volcanic stones, the most abundant material on the island. The houses were also designed with thatched roofs tied with straw cords to withstand the strong winds. In addition, as winters on the island are characterized by being milder, *wavel* floors were rarely used (JEON, 2016). Another differential of the residences in Jeju corresponded to the *gulmok*, a heating system that does not exist in other regions of Korea.

FIGURE 18- Jeju style house plans



Source: The author. (adapted from SHON, 2011; JEON, 2016; ZLATARITS, 2018)

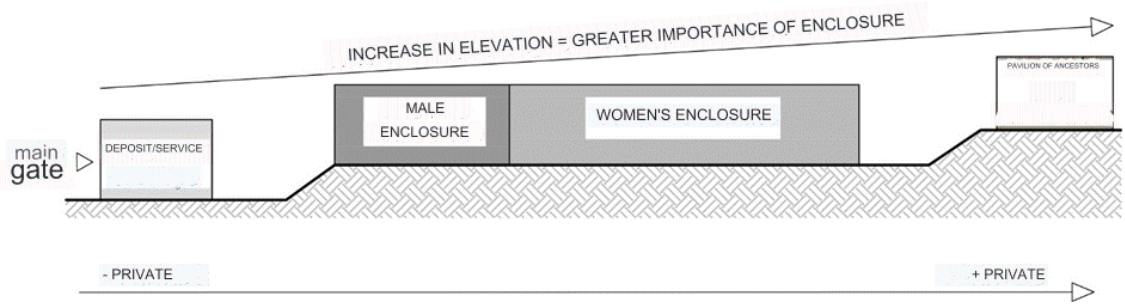
THE KOREAN HOUSE AND ITS SOCIAL HIERARCHY

Korean society in the Joseon Dynasty was also organized into classes, which reflected in the different styles of hanok (LEE, 2018). Residences of members of wealthier classes were called *banga* and, according to Zlatarits (2018), are what is now widely considered the epitome of the traditional Korean house. On the other hand, classes with lower purchasing power inhabited houses called *minga*. Also according to Zlatarits (2018), the main difference between these two types of *hanok* lies in the fact that houses of the poorest population were strictly focused on functionalism, while homes of more affluent families also gave importance to aesthetic factors.

The basic configuration of a *banga*, a residence belonging to members of the upper classes of the Joseon Dynasty, featured separate enclosures for men and women and a pavilion for ancestors (KRZYSZTOFIK, 2020). Most of these residences also had separate spaces for servants and warehouses, where items such as tools or grain were stored (ZLATARITS, 2018). This entire set was surrounded by a perimeter wall (JEON, 2016). As the residences of the elite were composed of several buildings, they were considerably larger than the residences belonging to members of lower purchasing classes (ZLATARITS, 2018).

Based on their importance, all the buildings that made up a banga were arranged in specific areas of the land, according to the distance from the entrance gate: the farther from the gate, the more relevant the enclosure was (CHOI, 2007). Along with orientation, the elevation of buildings also reflected hierarchy, where taller buildings were more important (ZLATARITS, 2018). Elevation was achieved both through the topography of the land and by artificial construction or, in most cases, through the combination of both (ZLATARITS, 2018).

FIGURE 19- Enclosures of a residence in relation to the main entrance gate and the elevation of the land, indicating hierarchy among its residents.



Source: The author. (adapted from ZLATARITS, 2018)

Near the entrance gate of the residence, in the lower portion of the land, were located the warehouse and the servants' enclosure (ZLATARITS, 2018). The serfs' enclosure was the space where the servants of the house worked and slept, however, in many cases, the serfs could have rooms inside the bosses' buildings (CHOI, 2007).

The central part of a banga corresponded to the space reserved for the lord and his family, which, following neo-Confucian precepts, was divided according to the gender of the resident (CHO, 2013). The interior of each of the enclosures was presented as a continuous space, with individual areas connected to each other instead of making use of physical barriers (ZLATARITS, 2018). This configuration was due to the fact that the house was used for multiple purposes, which required an uninterrupted interior (ZLATARITS, 2018).

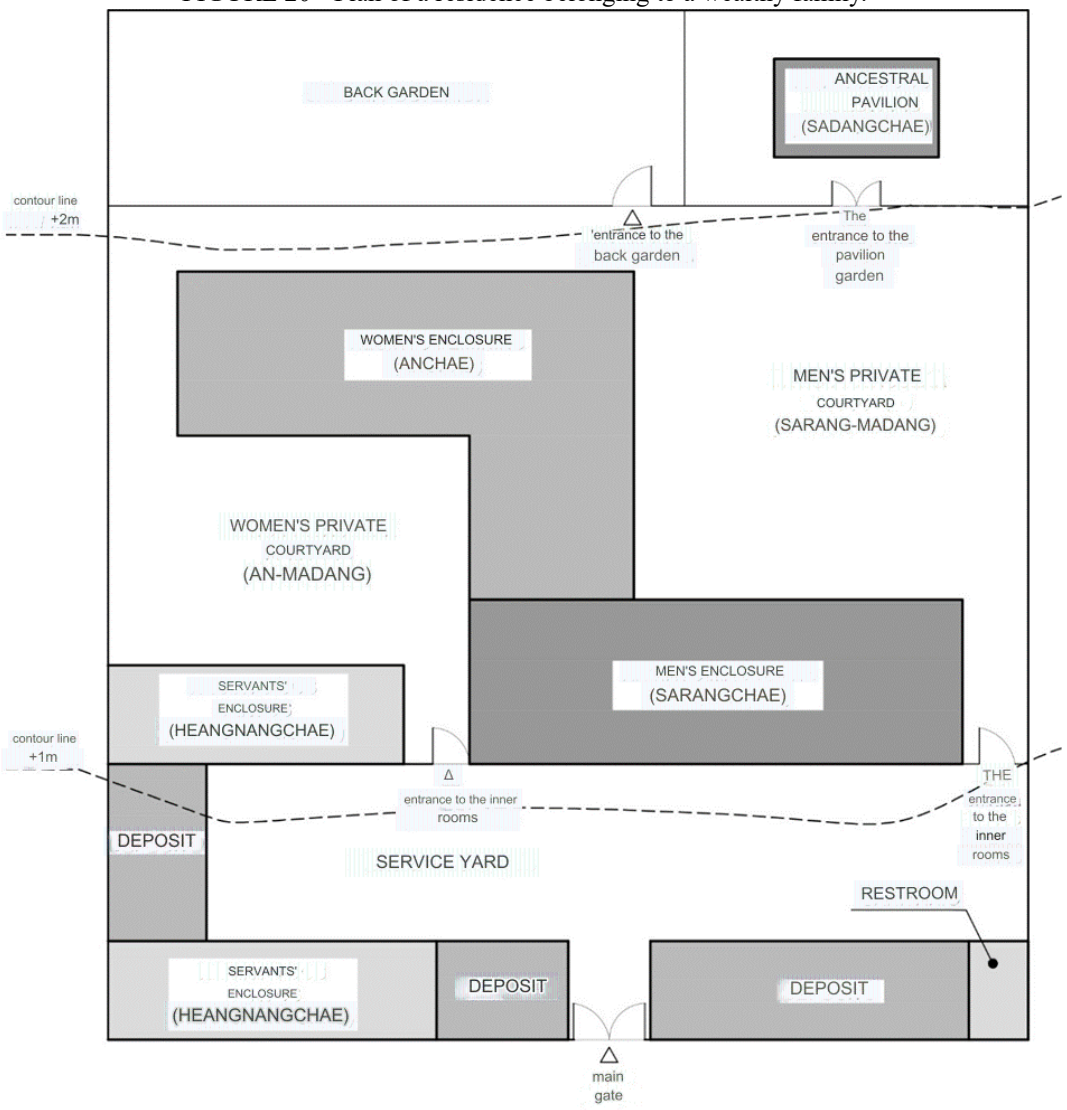
The enclosure of the lord of the house corresponded to the *sarangchae*, which generally included a private room, a bedroom, a lobby and a balcony, which were differentiated not by walls, but by the type of floor (CHOI, 2007). In these spaces, the head of the family carried out all daily activities, such as sleeping, eating, reading, drinking tea, receiving guests, resting, studying, practicing calligraphy, playing instruments, and playing games (KRZYSZTOFIK, 2020). The *sarangchae* also had a private patio, an exclusive space for the lord and other male members of the house, who used it to read and think (CHOI, 2007). Depending on the size of the family, many elite households could have more than one *sarangchae*, with the largest being intended for the head of the family and the smallest reserved for male children (ZLATARITS, 2018).

Next to the *sarangchae*, behind a low wall, was the enclosure intended for the wife of the head of the family (KRZYSZTOFIK, 2020). This enclosure, called *anchae*, usually had a private room, a lobby and a patio (CHOI, 2007). In many cases, the *anchae* also had a room for the family's daughter-in-law (SHON, 2011).

Residences of larger families also had an enclosure called *byeoldangchae*, which was close to the *anchae*, if inhabited by women, or close to the *sarangchae*, if inhabited by men (CHO, 2013). This structure was intended for the elderly parents of the lord or other dependent family members, such as unmarried daughters or young sons (KRZYSZTOFIK, 2020). Generally, the *byeoldangchae* had a room with maru, a room with *wavel*, a study room, a balcony and a patio (CHOI, 2007).

On the highest portion of the land, at the back of the main part of the house, the *sadangchae was built,* a pavilion reserved for the memory of the family's ancestors (CHO, 2013). In this pavilion, the residents of the house performed daily prayers and commemorative rituals on the date of death of each of the ancestors (CHOI, 2007).

FIGURE 20 - Plan of a residence belonging to a wealthy family.



Source: The author. (adapted from ZLATARITS, 2018)

On the other hand, in the period of the Joseon Dynasty, individuals of medium and low purchasing power, who constituted the majority of the population, inhabited the *minga*, a residence composed of a single building (ZLATARITS, 2018). The simplest layout of a minga was composed of a kitchen and two rooms with *a wave* (JEON, 2016). To contain a *maru*, the house needed to have a layout of at least four rooms. Therefore, this type of floor appeared more frequently in the homes of families with medium purchasing power (JEON, 2016)

As in the homes of families with high purchasing power, the *minga* contained separate multipurpose spaces for male and female residents, following the prevailing precepts of Neo-Confucianism (SHON, 2011). Closer to the entrance gate was the room of the male head of the family, called *sarangbang* (JUNG, 2014). The room intended for the wife of the head of the family, nicknamed *anbang*, was located in the innermost part of the house, which guaranteed greater privacy to the resident (JUNG, 2014). In the homes of low- and middle-income residents, the *anbang* was

almost always attached to the kitchen, where the woman performed most of her household chores (JUNG, 2014).

In many houses, the rooms of the owner of the house and his wife were separated by a main central lobby, usually with *maru* floors, called *daecheong* (ZLATARITS, 2018). This space was used for holding important family events, such as weddings, and also served as a dining room and reception room for guests (JEON, 2016). Unlike the residences of wealthier families, houses of low and medium income individuals had the kitchen in the same building as the residents' private spaces (ZLATARITS, 2018). In addition to serving as a space for cooking food, the kitchen also functioned as a storage space (JEON, 2016). Minga residences also contained a place reserved for the memory and worship of the family's ancestors, a distinctive feature of Joseon Dynasty dwellings. However, these places did not function in a separate building, as occurred in *bangas*, but in a space inside the house, usually located on the opposite side of the rooms of the head of the family (SHON, 2011).

MATERIALS AND STRUCTURE OF TRADITIONAL KOREAN ARCHITECTURE

Originally, hanok architecture made only use of natural materials, with stone, wood, and clay being the main materials used in the making of buildings (LEE, 2018). Paper was also frequently used in hanok houses because it has a soft texture and offers great flexibility (ZLATARITS, 2018).

Good quality stones, such as basalt, gneiss, andesite, limestone and sandstone, were widely used for the construction of residences (AHN, 2014). In particular, granite was widely used in the foundation, base and walls of buildings, especially those belonging to the higher classes (AHN, 2014). On the other hand, high-quality wood was not easy to obtain due to the topography, low rainfall, and dry air present in most of the Korean Peninsula. Thus, the material was used sparingly (AHN, 2014). Pine wood was the most used for the construction of *hanok building structures* due to the fact that it is characterized by being resistant and more malleable (LEE, 2018).

Because it is easily obtained and therefore inexpensive, clay was a fairly common building material in Korea during the Joseon Dynasty (ZLATARITS, 2018). The clay used for the construction of *hanoks* could be made with different types of soil, and the material was used in the design of bases, walls and floors (NATIONAL HANOK CENTER, 2017). In addition, clay was a fundamental component of roofing, because in addition to serving as a raw material for the manufacture of tiles, a layer of the material was applied above the wooden trusses to function as a thermal insulator (ZLATARITS, 2018).

The columns of the *hanok* were directly supported on foundations made of natural or polished stone, which transferred the load of the building to the ground or to a platform, similar to a stylobate (NATIONAL HANOK CENTER, 2017). This platform had the function of bringing a greater amount of sunlight into the house, preventing soil moisture from coming into contact with the floor and

better distributing the loads of the building to the foundations (CHO, 2013). The material, height, and surface face of the platform indicated which class the owner of the residence belonged to (CHO, 2013). In the Joseon Dynasty, most of the population had their houses built on platforms made of clay with the addition of gravel and pieces of wood, while houses of the elite usually featured platforms composed of granite (NATIONAL HANOK CENTER, 2017; CHO, 2013).

Although some special settlements of the wealthier classes used the stone structure, most of the houses in *hanok* had the wooden structural system (ZLATARITS, 2018). Typically, the wooden structure of the *hanoks* was all coupled by means of fittings in the wood, without the use of nails or glue (LEE, 2018). The most frequent type of fitting in *hanok* homes corresponded to the dovetail joint, where the connection of each of the elements was made with trapezoidal-shaped fittings (ZLATARITS, 2018).

The columns of the buildings were positioned on the stone foundations without the use of any type of connecting mortar (CHO, 2013). To do this, a method called *deombeong jucho* was applied, where the contact surfaces of the column and foundation were prepared in such a way that the two structural components remained interlocked (ZLATARITS, 2018). Thus, the structure remained stabilized and displacements due to horizontal movements caused by strong winds or earthquakes were avoided (KIM, 1998).

At the top of the columns there were pins and recesses for the fitting of the beams, which, after being placed, had the roof trusses fitted to them (LEE, 2018). After all the wood work was finished, the structure received a few coats of oil in order to ensure protection against humidity and attacks by xylophagous insects (ZLATARITS, 2018). The entire wooden structure was capable of supporting the weight of the roof, while the walls had no structural function (CHO, 2013).

The traditional walls of the hanok house were composed of a lathed weave filled with clay mortar, in a technique similar to wattle and daub (NATIONAL HANOK CENTER, 2017). For the making of the slats, preference was given to locally found materials, and bamboo, lespedeza strips or sorghum strips could be used (NATIONAL HANOK CENTER, 2017). The slatted weave received three layers of clay mortar, both internally and externally, and this was composed of clay, sand, chopped straw and water (NATIONAL HANOK CENTER, 2017). From the nineteenth century onwards, traditional walls were frequently replaced by dry wall panels (CHO, 2013).

Or *Hanji* corresponds to Korean handmade paper, a material used in the construction of houses in Korea since ancient times (ZLATARITS, 2018). Usually made from Chinese mora fiber (*Broussonetia papyrifera*)or *Hanji* it is a translucent and light paper, but at the same time, strong and durable, so it was used to cover doors and windows (LEE, 2018). Most of the openings were rectangular in shape and adapted to the human scale, based on the average height of the population at the time of the construction of the residence (ZLATARITS, 2018). Normally, doors and windows

used various wooden lattices covered with paper as closures *Hanji*, which, because it was translucent, allowed the visualization of the lattice patterns (ZLATARITS, 2018). Or *Hanji* was appropriate to protect the interior space of homes from various natural influences, because although it has an extremely thin thickness, the material has the ability to regulate humidity and offers good acoustic and thermal insulation, in addition to allowing the Partial entry of non-ambient natural light (ZLATARITS, 2018).

The ceiling of the hanok house varied according to the room, and could be suspended, flat and with a lower ceiling height or open to the roof and, therefore, with a higher ceiling height (CHO, 2013). The rooms heated with the *wavel* had a suspended and flat ceiling, which consisted of a lattice wooden structure filled and covered with rice paper or Chinese mora fiber paper (CHO, 2013). The other areas used the open roof for the roof, which left the beams and rafters of the residence exposed and the spaces between the structures were filled with white plaster (CHO, 2013).

The roof is an especially significant component for the identity of traditional Korean architecture (PARK, 2010). Furthermore, the first impression provided by a *hanok* depended heavily on the type and size of its roof because this element demonstrated both the structural and aesthetic characteristics of the residence (NATIONAL HANOK CENTER, 2017). In the Joseon Dynasty, the roofs of *hanok* houses had a diversity of materials and shapes, varying proportionally to the purchasing power of the homeowner, climatic influences, and the local availability of the material (ZLATARITS, 2018). Regarding the materials, they could be covered with tiles, rice straw, stone, eulalia grass or oak bark, and the most common types corresponded to the roof covered by ceramic tiles and the braided rice straw roof (LEE, 2018). Ceramic tiles were often used on the roofs of palaces, temples, and *hanoks* of elite families, while most homes of ordinary individuals featured thatched roofs (NATIONAL HANOK CENTER, 2017).

TECHNICAL-CONSTRUCTIVE AND CULTURAL LEGACIES OF CASA *HANOK* IN CONTEMPORARY TIMES

The traditional Korean house underwent a notable change during the second half of the nineteenth century, when the introduction of contemporary construction techniques and materials began in Korea (SOHN *et al*., 2006). After a long period of voluntary isolation, Joseon opened its ports to foreign nations in 1876 and from this moment on, began to experience various external influences (JEON, 2016). Consequently, the *hanok house*, despite maintaining its distinctions, began to adopt the use of industrialized materials, such as glass, brick and metal, in addition to having partially experienced a standardization (JEON, 2016).

In 1910, Japan annexed Korea to its territory, beginning a colonial regime on the peninsula that lasted until 1945. Although in this colonial period Korea needed to respond to strong changes in

the pattern of urbanization and residential distribution patterns, as well as experiencing the arrival of modern elements to housing, such as electricity and running water, the way of living and the traditional residential spatial organization were not completely abandoned (SOHN *et al*., 2006).

Considering that housing is a combination of the apparent architectural style and the internal way of life, it is hardly possible to modify the type of housing without changes in lifestyle (SOHN *et al*., 2006). Thus, during the Japanese colonial regime, the Korean population did not immediately absorb foreign housing styles in the way they were (CHO, 2021). In reality, these were transformed into eclectic housing types based on the circumstances of the Korean Peninsula at that time, which resulted in complex styles with Korean, Japanese, and Western characteristics (SOHN *et al*., 2006). For example, rooms, structures, and exteriors incorporated foreign attributes, but *ondol* continued to be massively used to solve issues related to thermal comfort (SOHN *et al*., 2006).

In 1945 Korea gained its independence from Japan, and in 1950 it was plunged into a civil war that would last three years. As a result, the peninsula was divided into north and south and an armistice was signed between the two newly formed countries. Soon after this truce, South Korea began a housing reconstruction project, where the construction industry focused on the rehabilitation of buildings destroyed during the Korean War (JEON, 2016). To solve the housing deficit caused by the war, the government started a housing construction project, which did not adopt the *hanok* style, but the westernized one, due to financial issues and the greater availability of so-called modern construction materials (JEON, 2016).

Until the 1960s and 1970s, Korean cities abounded in *hanok* houses, but these were quickly replaced by large apartment complexes and industries after this period (CHO, 2021). This replacement was due to the significant economic growth experienced by South Korea, which resulted in an accelerated process of urbanization and industrialization and a consequent change in the housing market (JEON, 2016).

At this time there was an imbalance between supply and demand for building materials, where while wood was scarce, industrial materials, such as bricks and cement, were available at a more affordable cost (SOHN *et al*., 2006). Hanok constructions required continuous repairs that were not compatible with the routine of urban workers (JEON, 2016). The memory of the Korean War instilled the desire to have a strong and fireproof house and, in addition, the nuclear family became habitual from this moment on, and its size also played an important role in the prevalence of westernized residences (JEON, 2016). Due to the low availability of buildable areas in the country, numerous examples of one- or two-story hanok residences were demolished to make way for multifamily buildings that sought to meet the rapid and continuous population demand for housing in urban centers (LEE, 2018).

With this process, *hanok* buildings were on the verge of disappearing (KWON; AHN, 2021). However, in recent years, the trend towards the primacy of extensive apartment complexes has been reversed as the architectural legacy of traditional Korean houses has been rethought (CHO, 2021). An impetus for this corresponds to the bursting of the housing bubble in the wake of the Asian financial crisis in 1997, which brought awareness that reckless and overcrowded development would benefit neither landowners nor the general population (JEON, 2020). Eventually, the metropolitan government of Seoul, the country's capital, devised a plan to preserve traditional Korean houses as unique neighborhood attractions, and then the trend of regenerating hanok clusters spread to other provincial cities in South Korea (JEON, 2020).

It is currently a consensus that from a cultural and historical point of view, the preservation and protection of *hanoks* are essential to maintain Korea's heritage (KWON; AHN, 2021). Therefore, efforts have been made at the local, national and international levels to support and sustain the life of historic residential buildings (SHON, 2011). A recent movement is the adaptive reuse of traditional Korean buildings, which undergo renovations and are transformed into cafes, shops, libraries, and community service centers, among other facilities (CHO, 2021). This trend has gained space especially due to the growing wave of appreciation and popularization of Korean culture and the greater demand for buildings with identity and individuality, which has led to the rediscovery of *hanok* as a place with elegance and personality to enjoy (CHO, 2021).

The legacy of the hanok house is also present in contemporary Korean architecture, in an amalgam of twenty-first-century technologies, modern lifestyles, and contemporary culture (CHO, 2021). One of the factors leading to this hanok renaissance can be attributed to an increased awareness of environmental issues (JEON, 2020). The traditional Korean house is premised on harmony with nature, and constructions of this type seek integration with the surrounding natural environment and employ the use of natural materials and techniques that have less impact on the environment (AHN, 2014). In this way, it is a construction with sustainable aspects, a principle widely sought after by architects today.

Modern architecture in *hanok* is inspired by the natural principle of positioning the house to show and frame the landscape, in addition to remaining faithful to the materiality and characteristics of the interior (KWON; AHN, 2021). Although industrial materials are employed in *modern hanoks*, there is a preference for the use of traditional materials, which are considered more sustainable (CHO, 2021). For example, wood, widely used in neo-traditional Korean building structures, is a natural and biodegradable material and, at the same time, resistant and relatively light, which allows the installation of large and strategically positioned windows to allow a good view of the surrounding nature (KWON; AHN, 2021).

FINAL CONSIDERATIONS

In this article, it was evidenced that traditional Korean architecture is not exactly an object of visual appreciation, but a tool of aesthetic awareness that leads to the unity of nature, humans and the universe. Primarily, *hanok* houses aimed at harmony with the environment, climate, geography, landscape, human psychology and personal relationships, with architecture being treated as a holistic natural living element. Hanok seeks to take advantage of what the natural environment offers to improve man's habitation, in addition to the fact that this can also be understood as a form of expression in which Koreans show their spirituality and connection with heaven and earth. As a result, each region of the Korean Peninsula features traditional houses with different aspects, befitting each natural feature.

In recent years, the characteristics of the *hanok* have been re-examined and this type of residence has attracted interest as an alternative to apartment complexes. Sustainability has been a factor required by civil construction in current times and *hanok architecture* stands out in this regard for having the premise of adapting and using the natural environment to its advantage, as well as prioritizing the use of materials less harmful to the environment. What's more, the *hanok*, with its beauty and uniqueness, represents an identity for Korean culture by reflecting the country's history and society.

The house is the living space for human settlement, and its importance and condition in a person's life are determined by the society of their time. In this way, architecture in *hanok* currently undergoes a critical reinterpretation and is amalgamated with the way of life of the twenty-first century or has its principles applied in modern buildings. In addition, in contemporary times, hanok has been used for purposes other than residence.

Architecture is not just about filling the space with buildings, but about understanding the place taking into account its social, cultural, historical, and environmental essence. Each community has its own style of architecture that highlights its main characteristics and cultures, in addition to rescuing a sense of heritage, which provides them with a unique appearance. These styles cannot be separated from the culture in which they were developed and result in a regional and economic aesthetic of their own. In this context, *hanok* has a lot to teach about sensitivity and understanding of the essence of traditional Korean history and culture.

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Dynamo programming applied to the development of sustainable engineering projects via BIM methodology

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Kevin Maurício Guedes Silva[1], Natália Victória dos Santos[2], Glauco José de Oliveira Rodrigues[3] and Danielle Malvaris Ribeiro[4]

ABSTRACT

In the context of reinforced concrete, one of the main challenges faced by execution professionals is the correct interpretation and understanding of structural projects. The lack of proper understanding of these technical drawings can lead to a series of problems, such as: assembly errors, lack of compliance with current technical standards and even compromising the structural safety of the building. On the other hand, engineers and designers face their own challenges, especially about the time required to prepare the drawings. The pressure of tight deadlines often results in projects being drafted in a hurry, which can lead to significant design errors. In this context, the present work proposes an innovative solution: the development of a set of scripts using the Dynamo software aimed at structural engineering activities. These scripts are primarily intended to streamline the design process from conception to detailing. By automating repetitive and error-prone tasks, scripts not only reduce the time required to draw up drawings, but also significantly improve the final quality of formwork and reinforcement designs.

Keywords: BIM, Dynamo, Revit, Reinforced Concrete, Detailing.

[1] Highest degree and area (only one degree): Master's student in Civil/Structural Engineering.
Current institution: State University of Rio de Janeiro (UERJ)
E-mail: ke.mgs@outlook.com
[2] Highest degree and field (only one degree): Doctoral student in Civil/Structural Engineering
State University of Rio de Janeiro (UERJ)
E-mail: nataliasvictoria@gmail.com
[3] Highest Degree and Area (one degree only): Doctor of Civil/Structural Engineering
State University of Rio de Janeiro (UERJ)
E-mail: glauco.grengenharia@gmail.com
[4] Highest degree and field (only one degree): Doctoral student in Civil/Structural Engineering
State University of Rio de Janeiro (UERJ)
E-mail: daniellemr.ieea@gmail.com

INTRODUCTION

The engineering industry has witnessed significant changes, driven by the implementation of new technologies in its processes. One of these landmark transformations was the introduction of Computer-Aided Design (CAD). Before its advent, engineering projects were prepared manually, requiring a considerable investment of time and effort. With the incorporation of CAD, engineers and architects have gained access to a diverse set of digital tools, enabling them to create, modify, and optimize designs faster and more accurately. [1]

A new revolution in engineering has been taking place, led by Building Information Modeling (BIM). BIM, at its core, consists of creating an intelligent, multidisciplinary virtual model of a project throughout its entire life cycle (Eastman et al., 2014). One of the main advantages of BIM lies in its ability to facilitate collaboration and the exchange of information between the various stakeholders in the construction process. Unlike traditional approaches, in which different professionals worked in isolation with their 2D drawings or 3D models, BIM creates a shared platform on which architects, structural engineers, MEP (Mechanical, Electrical, Hydraulic) engineers, and other participants can contribute to a single comprehensive model.

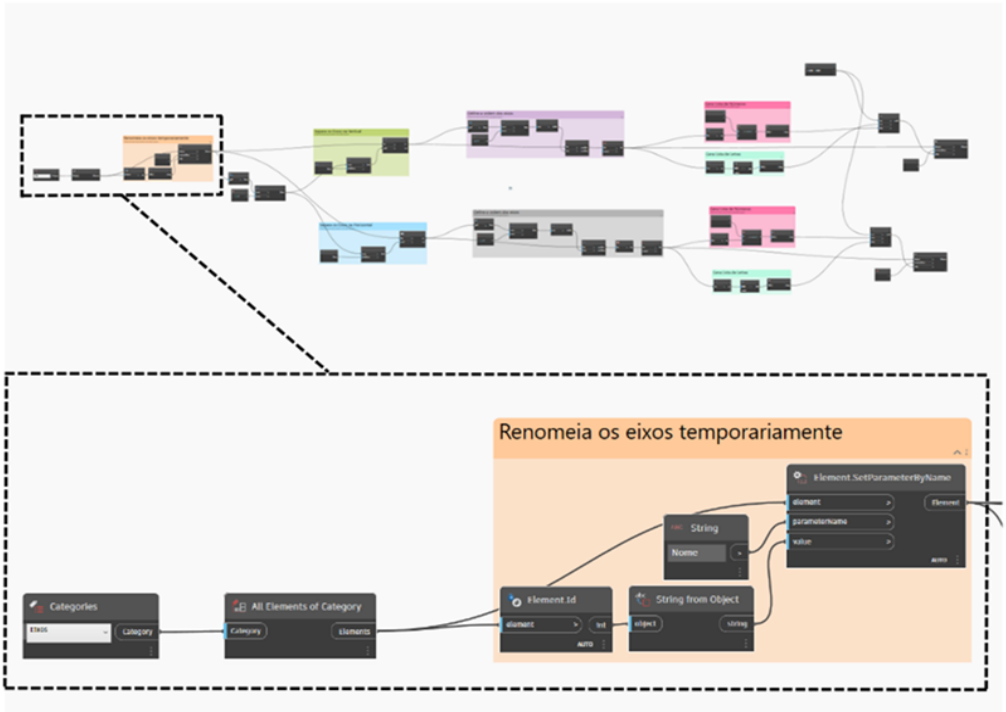
The multidisciplinary nature of BIM makes it possible to detect and resolve conflicts during the design phase, reducing the likelihood of errors and conflicts during construction. In addition, BIM provides an amount of data that goes beyond geometric representation, including material specifications, cost estimates, and construction schedules. This information is invaluable for project management, helping teams make informed decisions and optimize resource allocation [2].

Inconsistencies, inaccuracies, and uncertainties in the design make it difficult to manufacture the materials outside the construction site [2]. It is often during the construction phase that such errors are detected, resulting in sudden changes in the design to fit the field and the consequent expenses arising from these errors. This need for sudden adjustments highlights the importance of improving accuracy from the design conception in order to reduce the occurrence of sudden modifications and save time and effort during execution. Therefore, the search for solutions that optimize the process of designing and drafting, such as the use of automation tools, becomes essential to ensure the effectiveness and quality of the work of engineers and designers.

The use of BIM can be greatly enhanced with the help of programming in Dynamo software, a visual programming tool present in Autodesk software. Dynamo has a visual interface, which means that users create scripts through a graphical representation, connecting blocks of functions into a flowchart logic. This makes programming more accessible for those who may not have experience with traditional coding. By using Dynamo programming, it is possible to speed up the modeling of elements and automate repetitive tasks that are susceptible to human error. This

automation streamlines the design process, allowing professionals to focus on more complex and more value-added activities.

Figure 1: Example of a programming routine in Dynamo



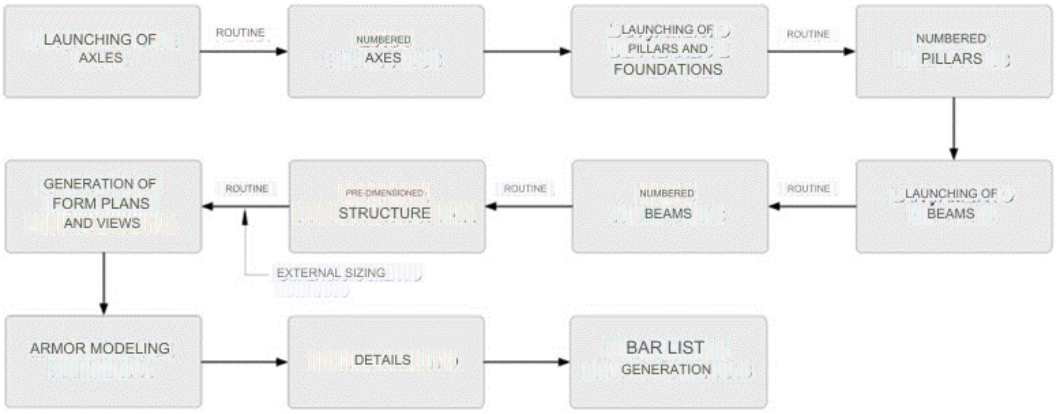
Source: the author.

Dynamo works by manipulating and handling the parameters (or information) of elements in Revit. Parameters in Revit play a key role in defining and controlling the properties of a model's elements. The correct definition of parameters in Revit is extremely important in ensuring the interoperability of the model. Interoperability refers to the ability to efficiently and accurately exchange information between different software and disciplines involved in a construction project. In the following items, the logics used in the routines will be explained. Thus, this article aims to automate structural projects using BIM technology. To this end, through the Dynamo software, routines were developed in order to streamline the design process from its conception to the detailing phase.

DEVELOPMENT OF ROUTINES

Dynamo scripts are designed with a project's workflow in mind, from defining structural axes to launching columns, followed by beams, slabs, and foundations. Subsequently, a script for the pre-dimensioning of the beams was developed. In addition, routines were developed to document the project, such as the numbering of the elements and the generation of plans and views. Figure 2 exemplifies the workflow developed.

Figure 2: Script production flowchart.



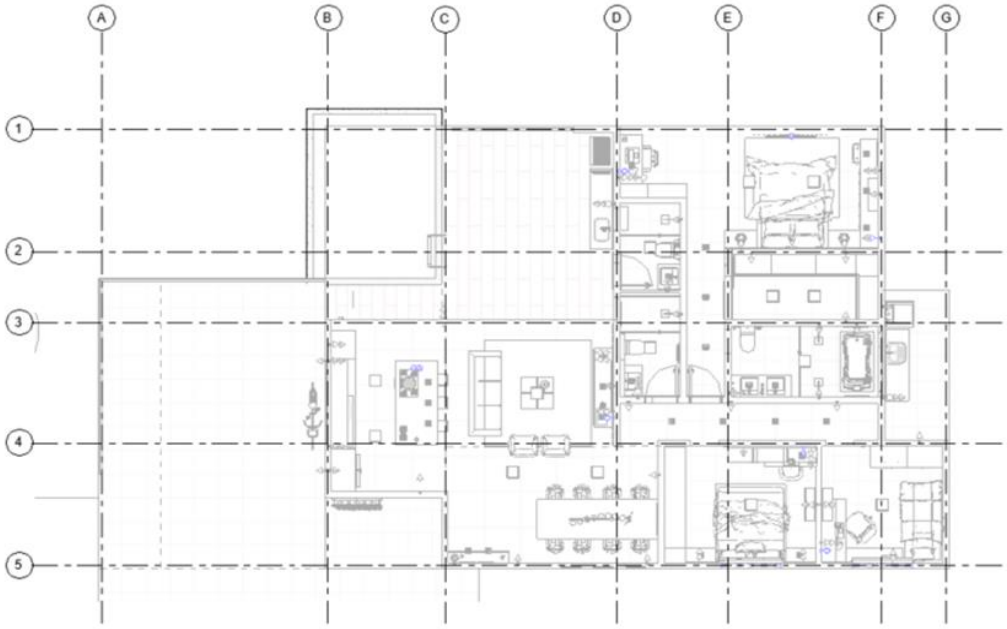
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AXLE NUMBERING

First, the routine examines the number of axes in the project and divides them into two groups: vertical and horizontal axes. This is done by creating vectors parallel to each axis and comparing them with the Cartesian axes X and Y. Once separated, the user can specify whether he prefers one of the groups to be identified by numbers and the other by letters. For example, vertical axes can be numbered sequentially, while horizontal axes can be labeled alphabetically.

Finally, the routine determines the order of the axes from top to bottom and left to right. It calculates a center point for each axis and compares its coordinates to order them. The routine then counts how many axes there are in each group and enumerates them according to the sequence defined for each group. Figure 3 shows the result of the routine.

Figure 3: Numbered axes



Source: the author.

NUMBERING OF PILLARS AND FOUNDATIONS

The principle of operation of the routine is based on an organization of the pillars and foundations by their Y and X coordinates in the global system. First, the routine orders them according to their Y coordinates, that is, in their vertical position. Then, it performs a second organization, now based on the X coordinates, that is, in its horizontal position. In this way, a logical sequence of the pillars and foundations is obtained, aligned with their position in the project.

Once the ordered sequence is established, the routine generates a list containing the total number of columns and foundations. With this list in hand, the numbering is assigned automatically and consecutively, ensuring that each one receives the number corresponding to their position in the sequence.

BEAM NUMBERING

The beam numbering routine presents a complex process for obtaining and arranging the beams of the project. Initially, all beams are collected and sorted into horizontal and vertical beams. From there, a comparison procedure is carried out with all the other beams in the project to check if there are intersections between them. When identifying intersections, beams that share segments are grouped into sublists, representing continuous beams.

After the formation of the sublists, the routine identifies if each sublist has more than one element, indicating the presence of connected spans in the beam. If so, sequential letters ("a", "b", "c", etc.) are generated for each span, providing the appropriate distinction between the segments. An additional challenge faced during programming was the need to start numbering the vertical beams from the number of the last horizontal beam. This detail was solved in the development of the routine, ensuring the correct numbering. In addition, a prefix option has been added, which allows the user to define the default they want for the nomenclature (e.g. V101a)

STRUCTURE PRE-DESIGN

Pre-dimensioning is a crucial step in structural design, which takes place in the initial phase of the project. This stage aims to carry out a preliminary analysis of the structure, determining the approximate dimensions of the structural elements based on predetermined estimates and criteria.

A common approach to beam pre-design is to adopt the L/10 ratio, where "L" represents the clear span between the beam supports. This ratio suggests that the height of the beam should be approximately equal to 1/10 of the span. [3]

This routine will be able to identify the span of the beams and, based on the L/10 criterion, will perform the pre-dimensioning, ensuring an adequate initial height for each beam. In addition, the values obtained will be rounded to multiples of 5 centimeters, following the usual practice.

Another important feature of the routine will be the identification and treatment of continuous beams. The user will have the flexibility to choose between two approaches: pre-design the continuous beams according to the largest span found, thus standardizing the section of the entire beam, or pre-design by section, considering individual spans.

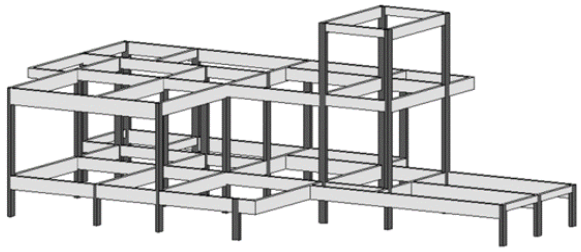
After these steps, the job will generate a report in .xls format, containing all the relevant information used in the pre-sizing process. This report will provide an overview of the data, including beam spans, estimated heights according to the L/10 criterion, and the resulting cross-sections after rounding. Figure 4 shows an example of a spreadsheet generated by Dynamo, and Figure 5 shows the model already pre-sized.

Figure 4: Dynamo-generated spreadsheet

TABELA DE PRÉ-DIMENSIONAMENTOS DAS VIGAS						
Vigas	b(cm)	Vão - Lef (cm)	h(cm) Calculado	h(cm) calculado	h(cm) uniformizado adotado	Seção Transversal (cm x cm) Adotada
V101a	15	80,00	8,00	25	40	15x40
V101b	15	345,00	34,50	35	40	15x40
V101c	15	275,00	27,50	25	40	15x40
V101d	15	380,00	38,00	40	40	15x40
V102	15	850,00	85,00	85	85	15x85
V103a	15	282,50	28,25	30	45	15x45
V103b	15	432,50	43,25	45	45	15x45
V103c	15	275,00	27,50	30	45	15x45
V103d	15	380,00	38,00	40	45	15x45
V104	15	560,00	56,00	55	55	15x55
V105a	15	275,00	27,50	30	40	15x40
V105b	15	380,00	38,00	40	40	15x40
V105c	15	160,00	16,00	25	40	15x40
V106a	15	560,00	56,00	55	55	15x55
V106b	15	282,50	28,25	30	55	15x55
V106c	15	432,50	43,25	45	55	15x55
V107a	15	425,00	42,50	40	50	15x50
V107b	15	492,50	49,25	50	50	15x50
V107c	15	307,50	30,75	30	50	15x50
V108a	15	255,04	25,50	25	25	15x25
V108b	15	255,04	25,50	25	25	15x25

Source: the author.

Figure 5: Pre-sized Model



Source: the author.

DETAILING

After the design of the structural elements, the next step would be to detail their reinforcement. To drill down to each element, you would need to create a plan view and sections individually for each one. Thus, a routine will be developed that will create the views for all the structural elements of the project.

FOUNDATIONS

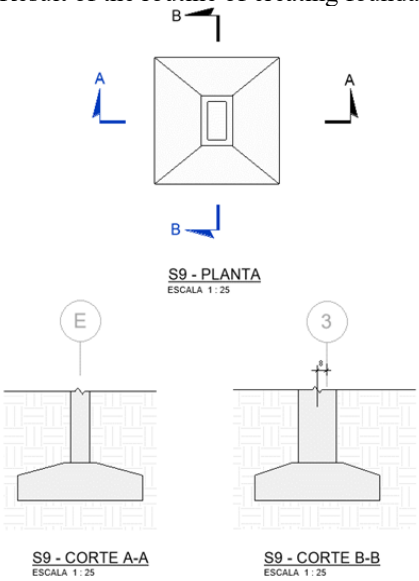
The routine is divided into two main blocks, which are:

1. Create the plan: In this case, Dynamo has the function of selecting the geometry of the footing/block and delimiting a region around it, where the plan will be created, then creates a unique view for the foundation, names the view with its name and applies the view model. E.g.: S10 or B10.

2. Create the sections: Based on the geometry of the foundation, create two sections, one horizontal and one vertical, and apply the correct view model.

The result of the routine can be seen in Figure 6.

Figure 6: Result of the routine of creating foundation views



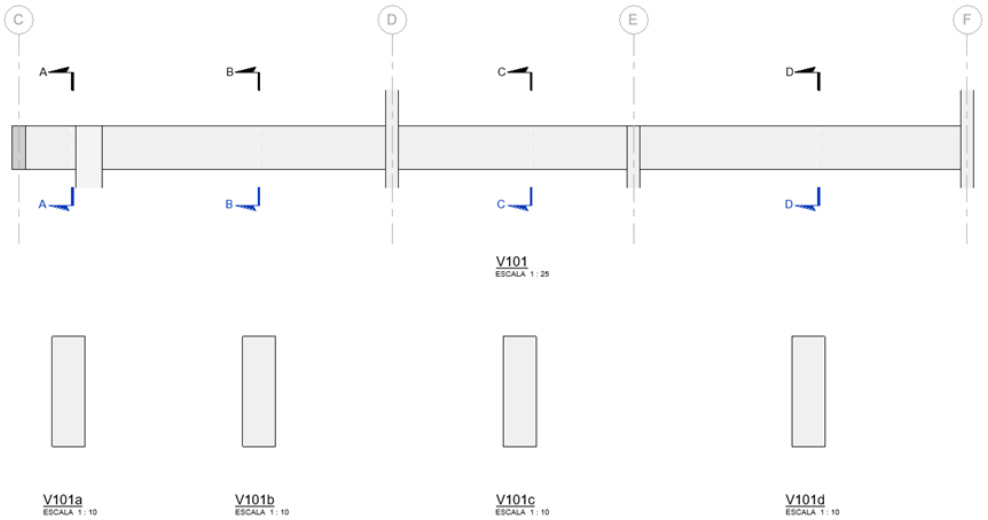
Source: the author.

BEAMS

The routine has two stages, in the first, the routine will initially select the beams and create an imaginary line on the axis of each one, recognizing continuous beams and grouping their lines. Then create the cut line and set the boundaries of the view crop. Finally, you create the section view and apply the correct view template. The routine also has a Python script that has the function of removing the alphanumeric index from beams, if they have one. For example a continuous beam that has several spans (V102a, V102b, etc.), the letter at the end will be removed to create a single view with the name V102.

In the second step of the routine, the goal is to create sections for each section of the beam. Then, the center point of each span is selected and the cut created transversely to the beam, like this in Figure 7.

Figure 7: Result of the Beam View Creation Routine



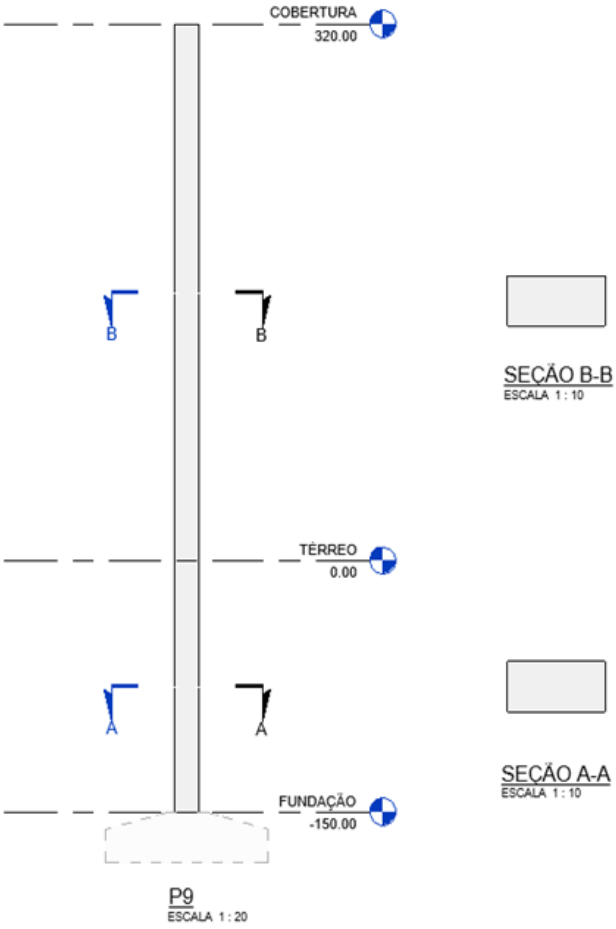
Source: the author.

PILLARS

To create the detailing, a routine similar to the foundation routine will be developed, where the column will be selected and in the middle of each floor that it passes, a cross-section will be generated. In addition, a front view of the column will be generated. The result can be seen in Figure 8.

The results illustrated by the figures represent only one structural element and each type, but the routine when executed does not generate the views only for one element, but for all those contained in the project. And with the views ready, you only need to model and detail the reinforcements.

Figure 8: Result of the routine of creating column views



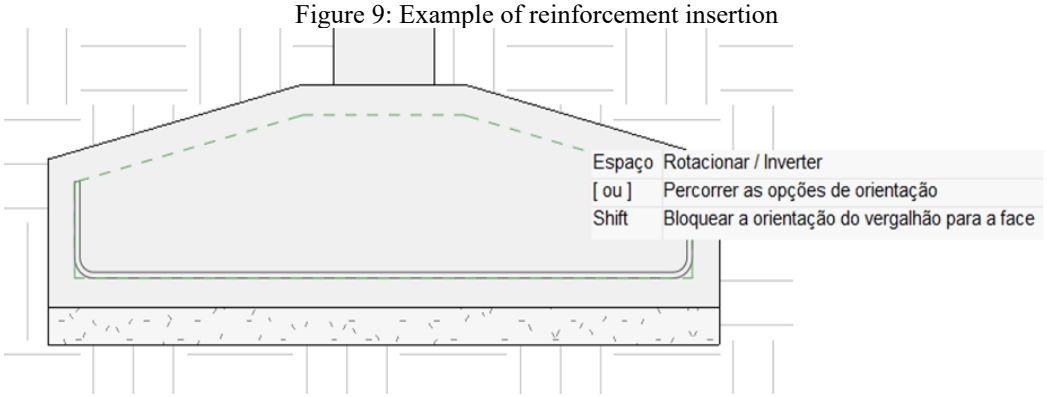
Source: the author.

ARMOR MODELING

A first step before starting the reinforcement modeling is the correct configuration of the commercial diameters and their characteristics according to ABNT NBR 6118:2023. For example, for each type of steel (CA-25, CA-50, CA-60) the software must be informed of the gauges, diameters of the bending pin, straight end of hooks, among other properties inherent to the bar. It is worth mentioning that all these configurations only need to be done once and can be reused in other projects.

By clicking on the structural element, the "rebar" function will be enabled in the "reinforcement" tab. You must select the desired gauge in the properties, rebar shape, and spacing tab. The reinforcement will automatically adapt to the structural element, already with the correct coverings, as seen in Figure 9. The same reinforcement modeling logic applies to any structural element.

Figure 9: Example of reinforcement insertion

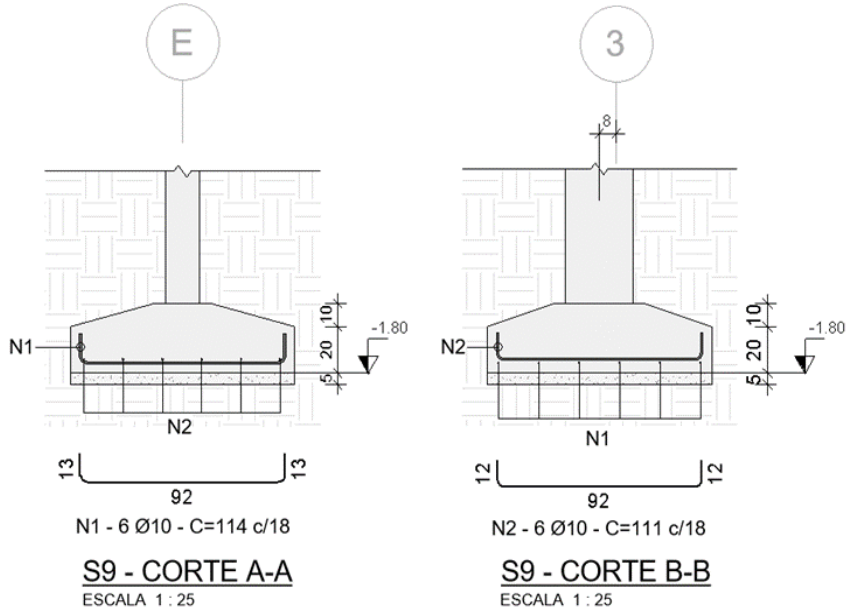


Source: the author.

Each bar modeled in a project carries with it a series of essential information for its correct characterization and detailing. This information includes its position, its gauge, its length, curvature details, among other relevant parameters. All this information will be represented automatically, using the identifier tool, as seen in Figure 10. Identifiers work by extracting information from the model. Thus, any modification made to the model members, whether in gauge, length or quantity, is automatically reflected in the corresponding identifiers.

By clicking on the structural element, the "rebar" function will be enabled in the "reinforcement" tab. You must select the desired gauge in the properties, rebar shape, and spacing tab. The reinforcement will automatically adapt to the structural element, already with the correct coverings, as seen in Figure 9. The same reinforcement modeling logic applies to any structural element.

Figure 10: Example of reinforcement detailing



Source: the author.

Bar lists are also automatically generated from the model data, as illustrated in the **Erro! Fonte de referência não encontrada.**. This avoids possible human errors that could arise during the manual process of summing the bar positions in the design.

One of the significant advantages of this methodology is the flexibility in generating the bar lists. The template parameters can be used to configure the lists in a variety of ways, allowing for a variety of representation options. For example, you can generate German-style lists, where each bar is represented in an exploded way in the drawing, or adopt the American system, in which the folding details are displayed directly in the bar list. [4] This customizability gives designers greater freedom in choosing the most suitable format for their specific needs.

Figure 11 Example of a steel abstract. List in German system on the left and American format on the right.

TABELA AÇO CA-50

POSIÇÃO	Ø	QUANT.	COMPRIMENTOS	
			UNIT. (cm)	TOTAL (m)
N1	8.0	4	391	15.64
N2	6.3	86	71	61.06
N3	8.0	4	203	8.12
N4	8.0	4	430	17.20
N5	8.0	4	164	6.56
N6	8.0	1	375	3.75
N7	8.0	2	253	5.06
N8	8.0	2	237	4.74
N9	8.0	2	85	1.70
N10	8.0	2	85	1.70
N11	8.0	2	375	7.50

RESUMO AÇO CA-50

Ø	COMPRIMENTO (m)	MASSA (kg)
6.3	61.06	14.96
8.0	71.97	28.43
MASSA TOTAL		43.39

N	Ø (mm)	AÇO	QUANT.	DOBRAMENTO	COMPRIMENTOS	
					UNIT. (cm)	TOTAL (m)
1	10	CA-50	2	25 / 250	273	5.46
2	6.3	CA-50	2	18 / 18 / 1090	1123	22.46
3	6.3	CA-50	2	18 / 860	877	17.53
4	5	CA-60	56	45 / 10 / 10 / 45	116	64.84

Source: the author.

CONCLUSIONS

The history of social and technological evolution converges on the time factor as one of its most valuable assets. In this sense, the work showed that the integration of the accurate and comprehensive representation of BIM, together with the developed routines, proved to be a highly effective strategy, both in improving the manufacturing time (mitigating rework due to eventual errors and/or design modifications) and in the understanding of technical drawings in reinforced concrete projects. Not only did the scripts make it possible to automate repetitive tasks, such as element numbering, speeding up the design process, but they also provided a flexible and parametric solution for creating drawings, allowing them to quickly adapt to design changes without having to redraw again.

The success of this approach is not just limited to saving time, but extends in technical terms. It was noted that with all families properly configured, they will already behave in accordance with current standards, for example with regard to bending diameters. In addition to the benefits

mentioned, the implementation of BIM provided the ability to extract accurate quantities from all materials involved in the project, contributing to efficiency in cost control. Thus, it is concluded that the integration between BIM and Dynamo schedules not only solved specific challenges in the context of reinforced concrete, but established an innovative approach to the improvement of the project life cycle.

All the applications created can be easily adapted to any design need, once the operating logic of the nodes is understood. As a suggestion for future work, the following routines can be developed:

- Pre-sizing footings based on column load and soil resistance;
- Pre-dimensioning of slabs;
- Automatic modeling of lean concrete layer under the footings;
- Automatic insertion of reinforcement in structural elements;
- Design of steel area in structural elements.

Additionally, the creation of routines aimed at the prestressed concrete area can be extended, such as:

- Laying of prestressing cable;
- Calculation of friction loss based on cable geometry;
- Calculation of shrinkage loss and creep of concrete.

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Approach to hypodermoclysis in geriatric palliative care

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Cristiele Rodrigues dos Santos[1], Gizele Soares Marques Honório[2], Izabella Coelho Ribeiro Camargos[3], Ludmila Melo Cardoso[4] and Marilza Alves de Souza[5]

ABSTRACT

This study consists of an integrative review on the use of hypodermoclysis in palliative care for elderly patients, focusing on the practice of geriatric nursing. Objective: Aspects such as puncture sites, device fixation techniques, catheter management and post-insertion care were discussed. Method: Methodological steps were used and we selected articles published between 2014 and 2024 in the MEDLINE, LILACS, and BDENF databases. Results: The results highlighted hypodermoclysis as a safe and effective technique for the administration of drugs and fluids, especially in patients with swallowing difficulties or compromised venous access. Final thoughts: Hypodermoclysis is a safe and effective technique for administering medications to older adults, especially in palliative care. It is practical, less invasive and offers greater comfort, promoting treatment adherence and patient satisfaction. The study reviewed its advantages and applications, highlighting it as a viable alternative to intravenous administration, especially in elderly patients. However, it identified gaps in knowledge that indicate the need for more research, especially to develop protocols that allow greater autonomy to nursing.

Keywords: Hypodermoclysis, Geriatrics, Palliative Care.

[1] Higher education, UNA/Betim University
LATTES: https://lattes.cnpq.br/5821007558937116
E-mail: christyellerodrigues21@gmail.com
[2] Higher education _Universidade UNA/Betim
LATTES: https://lattes.cnpq.br/3715701031824264
E-mail: _gizelesmh@hotmail.com
[3] Higher education, UNA/Betim University
LATTES: https://lattes.cnpq.br/7376861521824068
E-mail: Izabella1708@hotmail.com
[4] Higher education, -Universidade UNA/Betim
LATTES: https://lattes.cnpq.br/1474112115747843
E-mail: dmila.cardoso@hotmail.com
[5] Doctor-Social Psychology, Nurse HC-UFMG-EBSERH
LATTES: http://lattes.cnpq.br/8029123159873521
E-mail: marilzaalves1965@gmail.com

INTRODUCTION

In recent years, the aging of the world population has been a remarkable reality, driven by the reduction in mortality and fertility, resulting in an epidemiological transition characterized by a significant increase in the proportion of elderly people and the increasing prevalence of chronic diseases (Bonizio et al., 2021).

Currently, approximately 962 million people are 60 years of age or older, with projections indicating that this age group will represent 29.3% of the Brazilian population by 2050 (Silva et al., 2023).

In the context of geriatric care, hypodermoclysis emerges as a fundamental technique. This subcutaneous approach to fluid and medication administration not only meets the needs of elderly patients facing challenges with the oral route or venous access, but also offers a comfortable and safe alternative, with the potential to improve quality of life and treatment effectiveness (Bonizio et al., 2021).

Its benefits include better cost-effectiveness compared to other routes of administration and a lower risk of complications such as electrolyte congestion and infections (Martins et al., 2020).

In addition to its role in clinical management, hypodermoclysis plays a crucial role in palliative care, facilitating the continuous administration of fluids and medications, which are essential for relieving symptoms such as dehydration and pain in elderly patients during end-of-life (Guedes et al., 2019).

According to the Brazilian National Health Surveillance Agency (ANVISA), the device should be changed every 96 hours depending on the type of catheter used and checking for phlogistic signs at the insertion site (Guedes, *et al*. 2019).

Among the drugs that can be used subcutaneously, we can highlight analgesics, antibiotics (DEXAMETHASONE, DIPYRONE, SCOPOLAMINE, FUROSEMIDE, ONDANSETRON, TRAMADOL HYDROCHLORIDE, METOCLOPRAMIDE, CEFTRIAXONE, MIDAZOLAM, MORPHINE SULFATE, RANITIDINE, OCTREOTIDE, LEVOMEPROMAZINE, HALOPERIDOL AND SCOPOLAMINE) (Martins, *et. al*. 2020).

This study aims to explore current practices and available evidence on hypodermoclysis in the elderly, highlighting its importance in contemporary geriatric practice and seeking to contribute to the continuous improvement of care in this field.

METHODOLOGY

This is an integrative review that was developed based on the proposal of Souza *et al* (2010), which establishes six steps: (1) Definition of the theme/guiding question; (2) Search or sampling in the literature; (3) Data collection; (4) Critical analysis of the included studies; (5) Discussion of the

results; (6) Presentation of the integrative review. For a better understanding of these steps, the theme was identified and the guiding question of the present research was elaborated: "What does scientific research explore about the hypodermoclysis technique in palliative care in geriatrics?".

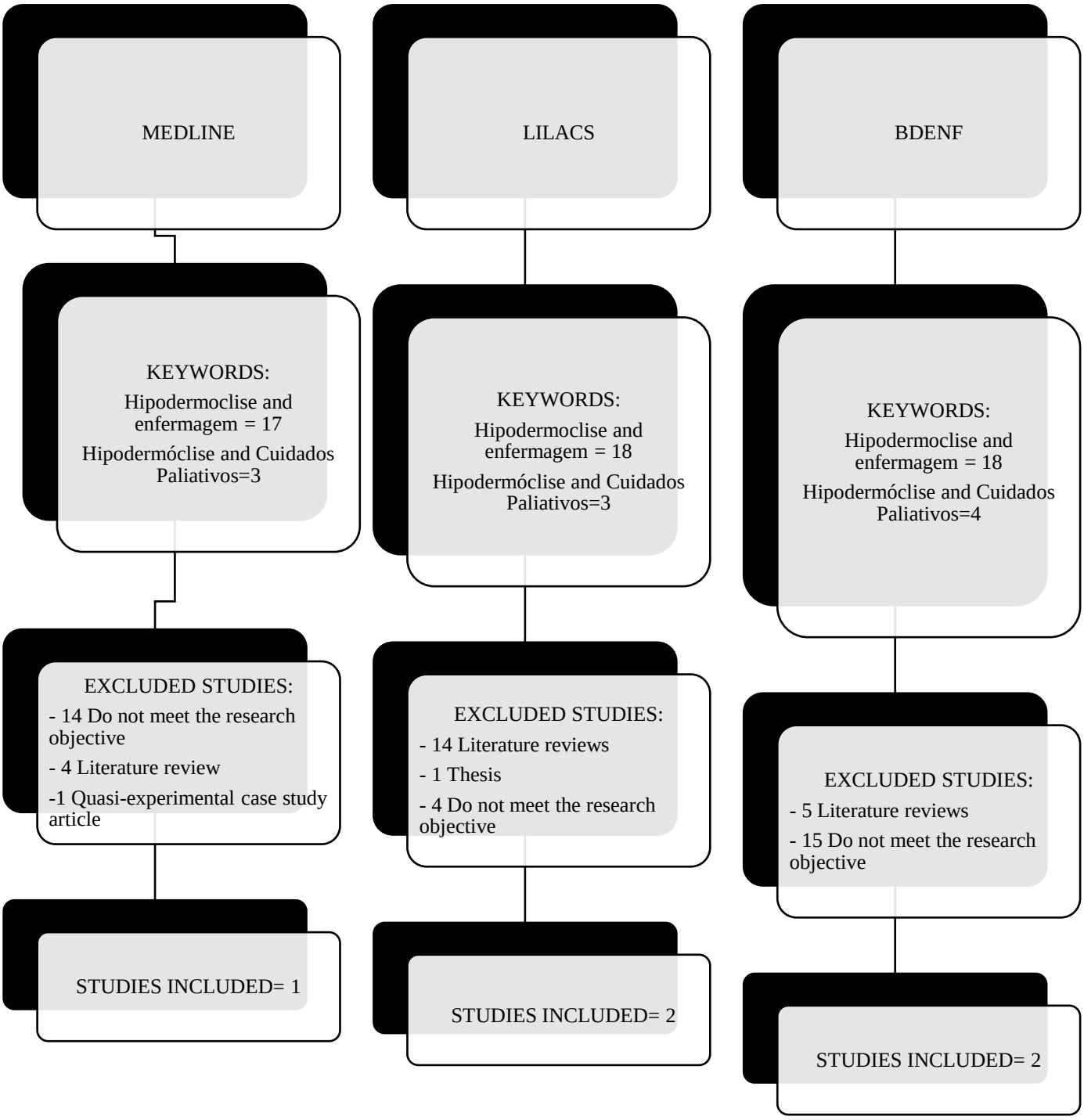
The selected samples had as inclusion criteria articles that were the objective of the research, and the exclusion criteria were articles that do not meet the objective of the research, case reviews, and quasi-experimental case study articles.

The data search was carried out in March 2024 in the Virtual Health Library (VHL), which includes the following databases: *Medical Literature Analysis And Retrieval System Online* (MEDLINE), Latin American and Caribbean Literature on Health Sciences (LILACS) and Brazilian Nursing Database (BDENF), in which they were "Hypodermoclysis AND Geriatrics AND Palliative Care".

In the search strategy, the following inclusion criteria were established: year of publication (2014 to 2024) in Portuguese and English, which addressed the proposed theme, and meta-analysis studies that were available in full. The exclusion criteria were: duplicate articles, available in the form of abstracts, which did not directly address the proposal studied, review articles, theses, dissertations, and articles that did not meet the other inclusion criteria.

After data collection, a critical analysis of the included studies was carried out, considering their relevance to the topic in question and their methodological quality. This stage involved evaluating the methods, results, and conclusions of each study, aiming to identify patterns, gaps in knowledge, and trends in the literature reviewed.

The identification of 05 articles was carried out through the VHL. Figure 1 shows the search process following the recommendations of the *Preferred Reporting Items for Systematic Reviews and Met-Analysis* (PRISMA).



Source: Prepared by the authors, 2024.

RESULTS AND DISCUSSION

Based on the selected articles, a table was developed containing the following information: year of the article, journal/level of evidence, title of the article, names of the authors, and objective. The five selected articles are presented in the table below.

YEAR	JOURNAL/ LEVEL OF EVIDENCE	ARTICLE TITLE	AUTHORS	OBJECTIVE
2016	Jornal os Nursing and Heath IV	Subcutaneous therapy for patients in palliative care: the experience of nurses in home care	CARDOSO; et AL.	To report the experience of nurses with the use of subcutaneous therapy to control symptoms in patients in palliative care cared for at home
2019	Rene- IV	Subcutaneous complications in the infusion of drugs and solutions in palliative care	GUEDES, N. A. B; et al.	To characterize the complications associated with the use of the subcutaneous route in the infusion of drugs and solutions in palliative care
2020	Geriatrics Gerontology and Aging/Brazilian Society of Geriatrics and Gerontology. II	Hypodermoclysis for correction of hyperosmolar dehydration and severe electrolyte disturbances: case report.	MARCO TÚLIO GUALBERTO CINTRA.	Treatment of dehydration and severe electrolyte disturbances is contraindicated by hypodermoclysis, but the level of evidence for the recommendation is based on expert opinion.
2020	Journal of Nursing of the Midwest of Minas Gerais III	Characterization of patients under palliative care undergoing peripheral venipuncture and hypodermoclysis	MICHELE ROCHA MOREIRA; et al.	To characterize cancer patients hospitalized under palliative care undergoing peripheral venipuncture and hypodermoclysis, according to sociodemographic and clinical variables.
2023	Nursing Journal of UFSM/ V	Analysis of peripheral intravenous drug use and hypodermoclysis in hospitalized elderly people	SILVA, R. M; et al.	To investigate the prevalence and complications of intravenous drug use and hypodermoclysis in hospitalized elderly people.

Source: Prepared by the authors, 2024.

As a result of the research, one level of evidence II study, one evidence study III, two evidence studies IV and one evidence study V are observed. In this context, we will have most of the levels of evidence classified as level IV. The final sample of the results was conducted by five articles selected in order to interpret the findings in the light of the objective of the integrative review, highlighting important clarity and possible implications for the practice of hypodermoclysis in geriatrics and the knowledge of the nursing team.

Hypodermoclysis is a procedure that can be used more frequently in the elderly in palliative care, a safe, easy, and acceptable technique for the administration of medications and infusions (Moreira, *et al*. 2023).

Although there is a differentiation between the terms hypodermoclysis and subcutaneous therapies in some contexts, in this study, both will be understood as the infusion of isotonic fluids and/or drugs subcutaneously. The indication for the use of this therapy in the context of palliative care occurs when other routes, such as intravenous or oral, are compromised or limited, due to clinical manifestations such as: nausea, gastrointestinal obstruction, dementia or unconsciousness. Although the oral route is preferred, many patients in palliative care need alternative routes of administration, since a large proportion have swallowing difficulties or other limitations (Cardoso *et al*., 2016).

In addition to the administration of medications, subcutaneous therapy may also be indicated for fluid replacement in cases of mild or moderate dehydration, especially when the intravenous route is compromised. One of the main advantages of this approach is the ease of application and handling, contributing to the autonomy and quality of life of patients in palliative care, while reducing the discomfort associated with invasive procedures (Cardoso *et al*., 2016).

The technique for inserting the catheter for subcutaneous therapy or hypodermoclysis is relatively simple and requires basic materials, including procedure gloves, cotton soaked in 70% alcohol, a catheter needled as a scalp (*butterfly*), sterile transparent film for device fixation, and a syringe with 0.9% saline solution to fill the catheter extension (Cardoso *et al*., 2016).

Although Guedes brings that the non-needled Abocath catheter (*Jelco*) is the most indicated, as it is more flexible and presents a lower risk of skin trauma for the patient and the lowest risk of occupational accident for the professional (Guedes *et al*., 2019).

As for the indication of catheters, in clinical contexts, ANVISA (National Health Surveillance Agency) advises against the use of devices with wings and a metal cannula (scalp) for the hypodermoclysis technique.

Before puncture, it is recommended to fill the catheter extension with saline solution to prevent air bubbles from entering the subcutaneous tissue during the administration of medication or fluids, which can cause local discomfort. This preventive measure aims to ensure a smooth and comfortable administration for the patient, minimizing possible complications (Cardoso *et al*., 2016).

After preparing the catheter and the insertion site, the chosen site is punctured. The device should be inserted at an angle of 30º to 45º and the bezel facing upwards. Next, it is important to aspirate the catheter to check that there is no presence of blood, making sure that it is located in the subcutaneous tissue and excluding the possibility of venipuncture. This step is crucial to ensure that the therapy is administered in the correct way, avoiding complications resulting from the inadvertent administration of drugs or fluids directly into the bloodstream (Cardoso *et al*., 2016).

Regarding puncture sites for subcutaneous therapy, the literature points to the subclavicular, interscapular, abdominal (flanks), anterolateral thigh, and deltoid region as the most appropriate (Guedes *et al*., 2019).

The high percentage of punctures in the anterolateral region of the thigh is attributed to the deficient nutritional status of most of the patients assisted. These regions are chosen because they have a greater layer of subcutaneous tissue, which facilitates the absorption of large volumes of liquids, and hydration is one of the main indications for the use of this route. When selecting the puncture site, it is essential to consider the volume of fluid to be administered, and the abdominal and anterolateral regions of the thigh are good options in situations that require larger volumes. This

approach aims to ensure effective and comfortable administration for the patient, optimizing treatment outcomes (Guedes *et al*., 2019).

Regarding the fixation of the device, the use of sterile transparent film is recommended by institutions, following the most recent guidelines, because in addition to protecting and preventing infections at the puncture site, it allows continuous visualization of the puncture site, contributing to the prevention of device loss (Guedes *et al*., 2019).

Regarding the average catheter permanence time, the institutional protocol indicates the replacement of the device every 5 days, with the possibility of extending this period in specific circumstances evaluated by the nursing team. However, it is recommended to remove the device in cases of complications and replace it with a new one with a minimum distance of five centimeters from the previous site, even if the puncture is recent, ensuring the safety and efficacy of the treatment. It is observed that the situations that require catheter removal due to complications are minority, evidencing the safety in the use of this resource in the context of health care (Guedes *et al*., 2019).

It is recommended to use hypodermoclysis with different accesses for hydration and administration of medications, and it is advisable that each puncture site receives a maximum of three drugs compatible with each other, in order to ensure the efficacy and safety of the procedure. The recommended daily volume for infusion is 2,000 ml over 24 hours, divided into 1,000 ml per puncture site (Cardoso *et al.*,2016).

Subcutaneous therapy emerges as a less painful and easy-to-manage option, complications are generally rare and tend to occur when the infusion rate is not adequate, resulting in mild local edema and mild discomfort, which can be alleviated by adjusting the infusion rate. In isolated cases of phlogistic signs at the puncture site, catheter removal and relocation have been sufficient, without significant adverse effects (Cintra, 2020).

The incidence of serious complications, such as cellulitis, allergic reactions to the catheter, hematomas, or tissue necrosis, has been minimal or nonexistent in recent studies. Although the technique is considered safe and with few complications, some limitations are observed, such as the restriction on the ability to administer large volumes, limitation with the use of electrolytes and certain medications, such as DIAZEPAM, PHENYTOIN, DICLOFENAC and undiluted electrolytes. Despite these limitations, most drugs needed for treatment and symptom control can be administered by this route (Cardoso *et al*., 2016).

The main drugs used in the hypodermoclysis technique are analgesics, such as dipyrone or Tramadol for pain relief; and antibiotics, such as ceftriaxone, to treat infections. In addition, saline solutions, such as saline or lactated Ringer's, are commonly administered to maintain hydration and replenish electrolytes (Guedes *et al*., 2019).

In addition, there is the option of performing the infusion discontinuously throughout the day, being interrupted according to the patient's wishes, or opting for nocturnal administration, synchronized with the sleep period, in order to provide comfort to the patient during the treatment process. These flexible approaches allow subcutaneous therapy to be adapted to the individual needs of each patient, maximizing the benefits of the treatment and minimizing possible discomfort (Cardoso *et al*., 2016).

The administration of drugs through hypodermoclysis provides gradual and prolonged absorption, which is especially advantageous in long-term treatments or in palliative situations. However, when administering multiple medications via hypodermoclysis, it is crucial to be mindful of potential interactions and incompatibilities between them. Some substances may interfere with the absorption or efficacy of others when administered simultaneously. Therefore, meticulous evaluation and careful supervision are necessary to ensure the safety and efficacy of treatment (Silva, *et al*. 2023).

FINAL CONSIDERATIONS

The literature review evidenced the importance of hypodermoclysis as a safe and effective alternative for the administration of medications in elderly patients, especially in palliative care. This technique offers significant advantages because it is a practical and less invasive procedure, with a lower risk of complications and greater comfort for elderly patients, thus contributing to treatment adherence and patient satisfaction, promoting humanized care.

This study achieved its objective by describing the available evidence on the knowledge and technique of hypodermoclysis, highlighting its applications and benefits.

We emphasize that the subcutaneous route is a viable alternative for the administration of drugs and solutions, especially in elderly patients who often have difficulties with other routes of administration, such as intravenous, offering a practical and less invasive solution for therapeutic management.

However, it was possible to observe gaps in knowledge and opportunities for future research, especially with regard to the implementation of specific protocols.

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