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SEVEN publicações acadêmicas

Epidemiological profile of COVID-19 in the Vale do Aço Region

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ABSTRACT

Introduction: The infection caused by the SARS-CoV-2 virus spread rapidly and moved public health teams around the world in search of answers regarding the clinical and epidemiological characteristics of the disease, forms of transmission and prevention. According to the World Health Organization, a strategic plan of preparation, preparedness and rapid response consistent at the national, regional and global levels was needed, which allowed the end of the acute phase of the pandemic, as well as the stabilization of the occurrence of new cases. In this sense, it is essential to understand the epidemiology in the different scenarios to propose strategic measures for the prevention and control of the disease at the different levels of care. Objective: The present study aims to describe the characteristics of severe COVID-19 in the Vale do Aço region – Minas Gerais. Methodology: The research was carried out through a cross-sectional study based on the collection and analysis of secondary data, made available by the Regional Health Secretariat of Coronel Fabriciano, located in the municipality of Coronel Fabriciano, Minas Gerais. These data relate to the confirmed cases of severe COVID-19 that occurred between February 2020 and July 2022, in the cities of Coronel Fabriciano, Ipatinga, Santana do Paraíso and Timóteo. After obtaining these data, they were organized and tabulated in a spreadsheet in the Excel® program, where averages, absolute and relative frequency were calculated. Results: The preliminary results showed that there were 6041 cases of severe COVID-19 in the Vale do Aço region, of these, 56% (n=3374) were from the city of Ipatinga. 54% (n=3269) of the sample corresponded to males, and the mean age was 60.6 years. The symptoms presented by the patients were mainly cough (79.6% - n= 4473), dyspnea (80.1% - n=4442) and fever (61.3% - n=3264), such that about 59% (n=3543) of the sample had a pre-existing risk factor. Regarding the evolution of the cases, about 30% of the individuals died. Conclusion: Given this, it was possible to characterize the individuals who were in a serious condition due to the infection in the region, which may be an aid in the creation of measures to combat it.

Keywords: Coronavirus, Epidemiological profile, COVID-19.

1 INTRODUCTION

With the emergence in December 2019 of the first cases in Wuhan, China, a virus of the Coronaviridae family, called SARS-CoV-2, has put the world on alert with its rapid spread. COVID-19 has affected more than 700 million individuals worldwide, causing more than 7 million deaths, while in Brazil, there have been more than 37 million confirmed cases and more than 690,000 deaths. (LANA et al., 2020; LIMA, 2020; PAHO, 2020; WHO, 2022).

Given the forms of contagion (direct, indirect or close contact with infected people through salivary and respiratory secretions that are eliminated through coughing, sneezing or speech) and the characteristics that the disease demonstrated, epidemiology defined that the best way to prevent SARS-CoV-2, would be social isolation, because it accesses that people become infected at a lower speed and, Thus, the health system can meet the demand presented by each city and state of the countries. In addition, efficient testing and screening demonstrate positivity in controlling the virus, in addition to mass vaccination (MACIEL, 2020; XAVIER et al, 2020).

With the increasing number of people infected by COVID-19, epidemiology has gained great prominence, as it is the part of health science that studies epidemics and factors that are related to the illness of the population, whether they are environmental, social, cultural, genetic factors and exposures to biological or chemical agents. Thus, the same search for more effective responses to emerging health demands and problems (LANA et al., 2020; OLIVEIRA et al., 2015).

Given the data collected and recorded by epidemiology, it is possible to draw an epidemiological profile about a given population and/or disease, thus identifying the points of vulnerability, which consequently need more support from health services and entities. Given this, the design of the epidemiological profile in each region can help in a positive way in reducing cases and combating the pandemic, being a tool of extreme importance for scientific production (OLIVEIRA et al., 2015). Thus, the present study aimed to describe the characteristics of individuals who presented severe COVID-19 in the region of Vale do Aço – Minas Gerais.

2 METHODOLOGY

This is a cross-sectional study conducted through the analysis of data collected through the influenza surveillance system, SIVEP-Gripe, through the regional health of Coronel Fabriciano, Minas Gerais. These refer to confirmed cases of COVID-19 that required hospitalization and/or died in the metropolitan region of Vale do Aço, which comprises the municipalities of Coronel Fabriciano, Ipatinga, Santana do Paraíso and Timóteo.

The data correspond to the severe confirmed cases that occurred between February 2020 and July 2022, and are arranged in an Excel® spreadsheet. For the study, the following variables were used: year of notification, gender (female and male), race/color (brown, white, yellow, black and indigenous), schooling (illiterate/no schooling, elementary school, high school and higher education), city of residence, presence or absence of clinical manifestations, risk factors and evolution of cases (cure or death). Then, the means, relative and absolute frequency of the variables were calculated, thus describing the epidemiological profile of the disease in the region.

The study was approved by the Research Ethics Committee (CEP) of the Centro Universitário Católica do Leste de Minas Gerais, under number 5,559,405 and followed the precepts of Resolution 466/12.

3 RESULTS AND DISCUSSION

Data collection identified 6,041 confirmed cases of severe COVID-19 in the Steel Valley metropolitan region between February 2020 and July 2022. Of these 55.1% (n = 3,374), corresponded to inhabitants of the municipality of Ipatinga, followed by Coronel Fabriciano with 19.4% (n = 1,172), Timóteo with 18.7% (n = 1,132) and Santana do Paraíso with 6.0% (n = 363).

It was noted that a higher number of cases occurred among males, 54.1% (n=3269) and the mean age was 60.6 years, of which 56.1% (n = 3,389) were individuals aged 60 years or more, as can be seen in Table 1. According to Drefahl et al. 2020, according to a study conducted in Sweden in 2020, male and older patients had a higher risk of death from the disease (DREFAHL et al., 2020).

Table 1 - Sociodemographic characterization of the sample of severe confirmed cases of Covid-19 in the Vale do Aço region, Minas Gerais between 2020 and 2022.

Variables	**n**	**%**
Gender (n = 6,041)		
Female	2765	45,8
Male	3269	54,1
Ignored	7	0,1
Age group (n = 6,041)		
Children and adolescents	105	1,7
Adult	2547	42,2
Old	2536	42
Long-lived elderly	853	14,1
Race/color (n = 6,039)		
White	856	14,2
Black	254	4,2
Yellow	48	0,8
Pardon	3938	65,2
Indigenous	1	0
Ignored	942	15,6
Education (n = 3,920)		
Higher education	88	2,2
Middle school	494	12,6
Fundamental cycle 2 (6th grade to 9th grade)	478	12,2
Fundamental cycle 1 (1st grade to 5th grade)	590	15,1
Illiterate/unschooled	147	3,7
Not applicable*	15	0,4
Ignored	2108	53,8

Source: Regional Secretariat of Health - Influenza Epidemiological Surveillance Information System, SIVEP-Gripe, 2022.
* Individuals aged < 7 years, therefore, had no measurable schooling.

Regarding race/color, according to table 1, it was observed that the largest number of seriously ill individuals self-declared as mulatto, 65.2% (n = 3,938). Corroborating this finding, a study of the association between neighborhood characteristics and COVID-19 mortality rates in Chicago noted that black residents were at the highest risk of death from COVID-19 (BRYAN, et al., 2021).

Table 2 - Clinical characterization of the sample of severe confirmed cases of Covid-19 in the Vale do Aço region, Minas Gerais between 2020 and 2022.

Variables	**n**	**%**
Clinical manifestations		
Fever (n = 5.325)		
No	1896	35,6
Yes	3264	61,3
Ignored	165	3,1
Cough (n = 5,620)		
No	1041	18,5
Yes	4473	79,6
Ignored	106	1,9
Sore throat (n = 4,715)		
No	3761	79,8
Yes	688	14,6
Ignored	266	5,6
Dispneia (n = 5.545)		
No	993	17,9
Yes	4442	80,1
Ignored	110	2
Respiratory distress (n = 5,072)		
No	1919	37,8
Yes	2926	57,7
Ignored	227	4,5
Low saturation (n = 5,226)		
No	1586	30,3
Yes	3461	66,3
Ignored	179	3,4
Diarrhoea (n = 4,707)		
No	3679	78,2
Yes	762	16,2
Ignored	266	5,6
Vomiting (n = 4,708)		
No	3761	79,9
Yes	680	14,4
Ignored	267	5,7
Risk factor (n = 6,041)		
No	2498	41,14

Yes	3543	58,6
Case evolution (n = 6,038)		
Care	4233	70,1
Death	1790	29,6
Death from other causes	11	0,2
Ignored	4	0,1

Source: Regional Secretariat of Health - Influenza Epidemiological Surveillance Information System, SIVEP-Gripe, 2022.
* Individuals aged < 7 years, therefore, had no measurable schooling.

When talking about clinical manifestations, dyspnea, low saturation and cough were the predominant signs among the individuals, corresponding to 80.1% (n= 4442), 66.3% (n= 3461) and 61.3% (n= 3264) of the cases, respectively, as can be seen in Table 2. This reinforces the study conducted by Abreu et al. 2020, which characterizes COVID-19 in a clinical-epidemiological way, where fever, dry cough and dyspnea, obtained a greater predominance among the confirmed cases for the disease (ABREU et al., 2020).

Analyzing the presence or absence of risk factors, 58.6% (n= 3543) of the cases had some previous comorbidity. The presence of comorbidities remained significant to explain the risk of coronavirus deaths in the study by Galvão et al. 2020, which conducted a survival analysis of individuals notified for COVID-19 in the state of Rio Grande do Norte (GALVÃO et al., 2020).

Finally, 29.6% (n= 1790) of the cases died from severe COVID-19 in the region, while 70.1% (n= 4233) were cured. From the analysis of the data it was possible to better understand the epidemiological profile of the disease in its severe condition, however, some limitations were found in the course of the tabulations and analyses, such as incomplete data or ignored by the inadequate completion of the compulsory notification forms, which hinders the processing of the data. However, the study demonstrates the reflection of the reality of the region studied and follows other national findings.

4 CONCLUSION

The results obtained characterize the epidemiological profile of severe COVID-19 in the metropolitan region of Vale do Aço between 2020 and 2022, characterized by a higher number of cases among men, elderly, self-declared browns, inhabitants of the city of Ipatinga, presence of fever, dyspnea, low saturation and risk factors.

The design and characterization of the course of the disease among individuals affected by COVID-19 in each location can be a tool for planning actions and policies to contain the virus, defining vulnerable and priority groups. In addition, it is worth sensitizing and training health professionals about the importance of properly filling out the compulsory notification forms for decision-making, as well as for understanding the reality of a pathology in each place.

REFERENCES

ABREU, Manuel Ramón Pérez. Características clínico-epidemiológicas de la COVID-19. Rev haban cienc méd, vol.19,n° 2. La Habana, abr 2020. Disponível em: http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1729-519X2020000200005. Acesso em: 09 abr. 2022.

BRYAN, MS et al. Coronavirus disease 2019 (COVID-19) mortality and neighborhood characteristics in Chicago. Ann Epidemiol. V. 56, p. 47-54.e5, apr 2021. DOI: https://doi.org/10.1016/j.annepidem.2020.10.011. Disponível: https://www.sciencedirect.com/science/article/pii/S1047279720304099?via%3Dihub. Acesso em: 08 abr. 2022.

DREFAHL, S et al. A population-based cohort study of socio-demographic risk factors for COVID-19 deaths in Sweden. Nat. Commun, v. 11, n. 5097, 2020.

GALVÃO, MHR; RONCALLI, AG. Factors associated with increased risk of death from covid-19: a survival analysis based on confirmed cases. Rev. Bras. Epidemiol. v. 23, e200106, 2021. DOI: 10.1590/1980-549720200106. Acesso em: 09 abr. 2022.

LANA, RM et al. Emergência do novo coronavírus (SARS-CoV-2) e o papel de uma vigilância nacional em saúde oportuna e efetiva. Cadernos de Saúde Pública [online]. v. 36, n. 3, 2020. Disponível em: https://doi.org/10.1590/0102-311X00019620. Acesso em: 08 abr. 2022.

LIMA, Cláudio Márcio Amaral de Oliveira. Informações sobre o novo coronavírus (COVID-19). Radiol Bras vol.53 no.2 São Paulo Mar./Apr. 2020. Disponível em: https://www.scielo.br/scielo.php?pid=S0100- 39842020000200001&script=sci_arttext&tlng=pt. Acesso em: 08 abr. 2022.

MACIEL, Ethel Leonor Noia. A Epidemiologia no enfrentamento da pandemia de coronavírus. Universidade Federal do Espírito Santo, 2020. Disponível em: http://coronavirus.ufes.br/conteudo/epidemiologia-no-enfrentamento-da-pandemia[1]de[1]coronavirus#:~:text=Ele%20pertence%20%C3%A0%20fam%C3%ADlia%20dos, S% C3%ADndrome%20Respirat%C3%B3ria%20do%20Oriente%20M%C3%A9dio). Acesso em: 08 abr. 2022.

OLIVEIRA, Cátia Martins de. CRUZ, Marly Marques. Sistema de Vigilância em Saúde no Brasil: avanços e desafios. Rio de Janeiro, v. 39, n. 104, p. 255-267, jan[1]mar 2015. Disponível em: https://www.scielo.br/pdf/sdeb/v39n104/0103-1104-sdeb[1]39-104-00255.pdf. Acesso em: 09 abr. 2022.

OPAS. Folha informativa COVID-19. Organização Pan-Americana da Saúde: Escritório Regional para as Américas da Organização Mundial da Saúde, 2 set 2020. Disponível em: https://www.paho.org/pt/covid19. Acesso em: 08 abr. 2022.

WHO. WHO Coronavirus (COVID-19) Dashboard. World Health Organization, 22 abr 2022. Disponível em: https://covid19.who.int/. Acesso em: 01 jul. 2022.

XAVIER, Jhonatan de Assis Dutra. ALVES, Frederico Lucas Braz. Entenda sobre o coronavírus – epidemiologia e precauções. J. Infect. Control, 2020 abr-jun;9(2):87- 88. Disponível em: https://jic-abih.com.br/index.php/jic/article/view/288. Acesso em: 09 abr. 2022.

SEVEN publicações acadêmicas

Therapeutic proposals of the SUS after suicide attempt in Brazil

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ABSTRACT
Suicide is the phenomenon that has been most addressed in society, since its numbers have increased significantly in recent years, drawing the attention of researchers and government officials to possible interventions in public health. Therefore, the present work aims to investigate the therapeutic proposals after suicide attempts in the services offered by SUS - Unified Health System - through exploratory bibliographic research in national sources. The research aims to understand which proposals are directed to these patients who are in a situation of vulnerability, in view of the high rates and incidences after suicide attempts. With this work, it is intended to contribute to the scientific production in Brazil and possible directions of the reception of the individual who attempted the act of suicide.

Keywords: Suicide, Therapeutic Proposal, SUS.

1 INTRODUCTION

In recent years, studies have shown high rates of suicide, causing this theme to reach multiple contexts, especially those related to life and health.

The term "suicide" has as definition "death of oneself", an intentional act of self-harm, which is planned to be lethal, being considered a multicausal phenomenon that involves several factors, such as environmental, cultural, biological, psychological and political, all included in the existence of the human being (MOUTIER, 2021).

According to the definition proposed by Edwin Shneidman (1985), suicide should be presented as a final consequence, reaching the maximum peak of disturbance, pressure and psychological pain, thus establishing that it is composed of a range of occurrences that put the individual's life at risk, considering them suicidal behaviors.

The sociologist Émile Durkheim made great contributions to the understanding of suicidal behavior with the work "The Suicide". Its object of study is society and social facts, taking into account the collective consciousness and what it produces in the individual who is inserted in it. Durkheim understands by suicide any death that "results directly or indirectly from an act, positive or negative, performed by the victim herself and that she knew that she would produce this result" (DURKHEIM, 2004, p.14).

Thus, Durkheim understands suicide as a social phenomenon that changes according to the society in which the individual is inserted. It is the result of a "sick" society, that is, it manifests itself as a pathology of the social bond, and can manifest itself in four different ways: 1) Selfish: caused by a helplessness of the social bond, in which the individual is led to the search for the meaning of his existence by himself, causing great anguish and melancholy; 2) Altruistic: how much the individual has a massive bond with society, not assigning value to oneself, resulting in total subordination to social ends; 3) Anomic: caused by sudden transformations in society, in which disintegration occurs through the absence of norms or laws, as in major economic crises (DURKHEIM, 2000).

The behavior encompasses completed suicide, which obtains intentional action and follow-up death; suicide attempt, from which self-harm occurs with deadly intentionality, but with no result – death; and suicidal ideation that consists of thoughts, strategies and preparation for the act (MOUTIER, 2021).

It is essential to understand that, although certain methods conceive a greater probability of death, the less lethal does not express less severity or seriousness, given that each individual carries with him specific characteristics, his biopsychosocial constructs that constitute every stage of his life cycle, from the juvenile to the elderly phase, being necessary to thoroughly evaluate each stage for better understanding (MOUTIER, 2021).

Suicide is responsible annually for about 1.4% of all deaths in the world, which corresponds to one million deaths, according to data from the World Health Organization, being among the three main causes of death in people aged 15 to 44 years (WHO, 2014).

These data correspond that every 45 seconds, somewhere in the world, a person commits suicide, which is equivalent to a contingent of 1,920 people – being higher than deaths from homicides, traffic accidents, wars and civil conflicts. The highest suicide rates are in Eastern European countries, according to data presented by the World Health Organization (WHO, 2009).

Brazil is among the ten countries with the highest number of deaths by suicide, according to data presented by the World Health Organization, occupying the eighth position, reaching about 24 deaths by suicide per day, but it is estimated that the rate is 20% higher than the stipulated number, since most cases are not registered. (WHO, 2014).

In the year 2011, the deaths recorded in the country represent about 27 deaths per day, which is equivalent to 9,852 deaths by suicide – 1% of the deaths recorded in Brazil are due to suicide in people between 15 and 29 years of age, the rate of deaths is equivalent to a rate of 4% of deaths (BRAZIL, 2013).

Between 2004 and 2010, the suicide mortality rate in Brazil was 5.7%, with 7.3% male and 1.9% female (MARÍN-LEÓN et al., 2012).

The rate of deaths by suicide remained stable between 1980 and 1994. That number was equivalent to a rate of 4.5 deaths per 100,000 residents. The number of deaths increased between 1995 and 1997 and remained stable until 2006.

According to data from the World Health Organization (WHO, 2019), about 97,339 people have committed suicide in the Americas, and estimates indicate that the numbers of attempts may exceed a number 20 times higher.

With the coming of the pandemic, the risk factors that are associated with the cause of suicide have increased – such as job loss, the death of a loved one, among others. In a study conducted by the World Economic Forum in Chile, Brazil, Peru, and Canada, people reported that their mental health had worsened after a year of pandemic (PAHO, 2021).

There is an estimate that suicide attempts exceed the number of suicides ten times more. In a survey conducted by the Brazilian Institute of Geography and Statistics (IBGE), 512 people were interviewed by researchers from the University of Campinas (Unicamp) in 2003, and of this number 17.1% have already thought about ending life, 4.8% have drawn up a plan, and 2.8% have effectively tried to commit suicide, however, only one was seen in an emergency room (BOTEGA et al., 2009).

The WHO Multicenter Study of Intervention in Suicidal Behavior (SUPREME MISS) estimates that 2,238 people were admitted to emergency rooms for attempted suicide (WHO, 2002).

The welcoming of the care team in the face of suicide attempts aims to identify emotional fragilities from the first contact with such patients, through active listening, thus reducing new suicide attempts. Listening to the patient, the professionals will have an improvement in the relationship and

will assist in the development of a more collaborative partnership (COSTA, GARCIA and TOLEDO, 2016).

According to the research of Freitas and Borges (2017), health services provide little acceptance and low operationalization of care focused on mental health in hospital contexts. The process in the emergency service, emphasizing time and productivity, takes almost a disposal of the individual, aiming at quick and almost contactless responses. Thus, emergency practices do not correspond to the needs of mental health patients who need greater availability by professionals.

For Gutierrez (2014), as health professionals have an important role in the situation of suicide attempt, the care that is provided should consider that the patient has health and hospital needs, guiding professionals to have comprehensive care that goes beyond the cure of a disease, and consider health care as ending the causes, treat the damage and decrease the risks. For some care team professionals, mental health demands for urgent and emergency services are not seen as legitimate emergencies.

Gutierrez (2014) also highlights that the permanence of the patient in the health service is an essential moment to give support and assist him in the search for a new meaning to his life, helping him in the development of greater autonomy. When the team is welcoming and respectful, this development of autonomy becomes more evident, therefore, it is essential that programs and strategies for the prevention of suicidal behaviors are integrated into the agenda of the training policies of these professionals and in public health. It is important that the team is trained and qualified on the subject in question, since they have a fundamental role and can effectively assist in this post-suicide attempt process.

Suicide is a matter of strong concern for the Brazilian Unified Health System (SUS), which seeks to adopt more strategic measures and conducts to be worked on in cases of suicide attempts and in consummated cases, as well as in the prevention of the act itself and in the monitoring of these individuals through public health.

From the significant increase in suicide attempts that has been occurring in the country, as previously mentioned, the SUS has established several ordinances and documents over the years that guide and help promote preventive actions at the individual and collective level, guiding and structuring the conducts to be followed by health agents. Today, in Brazil, the Psychosocial Care Network (RAPS), established by Ordinance No. 3088/2011, deserves great prominence, because it has some relevant therapeutic proposals for these cases, with the objective of developing points of attention to the mental health of the population, directed mainly to people with suffering or mental disorder, users of crack, alcohol and other drugs. This Psychosocial Care Network is composed of the Family Health Teams (FHT), Living Centers, Basic Health Units (UBS, UPA 24h, SAMU 192), Family Health Support Centers (NASF) and the Psychosocial Care Centers (CAPS) (GARBI, SANTOS, MOIMAZ and SALIBA, 2019).

> "The model of mental health care in Brazil, previously based on hospitalizations in psychiatric hospitals, went through a process of redirection to community mental health services, and with the creation of RAPS, it became possible to expand access to psychosocial care, articulating intersectoral actions, and allowing the regulation and organization of demand." (GARBI, SANTOS, MOIMAZ and SALIBA, 2019, p.134).

From this, obtaining this expansion of care for those who need psychological treatment within the RAPS, it became possible to adopt measures that seek to improve the reception and monitoring of these individuals, also facilitating referrals to other more specific sectors.

> "In short, it can be considered that the Ministry of Health is aware of the severity of the phenomenon, and while epidemiological surveys and bulletins make the government and the population aware of its extent, public policies are developed, optimized and updated." (GARBIN, SANTOS, MOIMAZ and SALIBA, 2019, p.139).

Suicide is a universal fact, and represents a major problem in public health services, both in Brazil and in the world. Suicide is considered by the World Health Organization as one of the leading causes of mortality worldwide, getting ahead of diseases such as HIV, breast cancer, malaria, and even wars and homicides (WHO, 2021).

In Brazil and in the world, the numbers of suicide have not decreased, on the contrary, they have been increasing every year or are stabilized. According to the World Health Organization (WHO) estimate, in 2019 more than 700,000 people died by suicide: one in 100 deaths, in which, led the WHO to produce new guidelines to help countries in suicide prevention and care (WHO, 2021).

According to Vidal and Gontijo (2013), many of the patients who are seen post-suicide attempt are often released and do not undergo a psychiatric evaluation or are not referred to services that can help this patient. After discharge, effective referral for psychiatric, psychological, and family and social support follow-ups is necessary (VIDAL, GONTIJO, 2013, p.112).

Vidal and Gontijo (2013) observe, however, that most patients who have attempted self-harm, in some cases that do not observe a very high risk of death, the individual is only referred to mental health services, without being sure to continue treatment and even adequate support for their case.

First, adequate and humanized care after the suicide attempt is essential, in which the first months are of greater risk for the patient to perpetrate new attempts. However, it is estimated that up to 60% of individuals who have attempted suicide do not attend more than a week after discharge from emergency services (VIDAL, GONTIJO, 2013, p.112).

For Vidal and Gontijo (2013), the treatment of patients who have mental disorders, especially patients who have attempted suicide, must be effective and carried out, safely, promptly and with quality so that the patient has a humanized care by the care team, and that can continue the treatment appropriately.

The objective of this study is to understand the therapeutic proposals of the Brazilian Unified Health System after the suicide attempt, presenting the epistemological data of suicidal behavior in Brazil and in the world, what are the strategies of the SUS after the suicide attempt and the behavior. The data that were collected will be correlated and analyzed through keywords and abstracts of articles available in electronic journals.

With the data presented above and that will be later resumed, it is known that the numbers of suicide attempts exceed the numbers of the consummated act, it is then necessary to give adequate support to the individual and his family, and the subject who tries to commit suicide may come to perpetrate new attempts (VIDAL, GONTIJO, 2013). Due to this fact, the research developed seeks to understand the appropriate therapy for the subject after suicide attempt in the Unified Health System.

2 METHODOLOGY

The present work was carried out through bibliographic research of books and recent scientific articles related to the subject under study, as a means of theoretical basis. This material search was done through platforms such as SciELO, LILACS and Google Scholar. For the search, the keywords "Suicide Attempt and Brazil", "Suicide Attempt and Welcoming", "Suicide Attempt and Strategies", "Suicide Attempt and Emergency Services" were used. After the research, the articles were chosen based on the year of publication.

The criteria regarding the inclusion and exclusion of the articles used were based on analyses about which were related to our theme in question and which dealt with the reception and services offered after the act of suicide attempt as the focus of the research.

For Martins and Theófilo (2016), bibliographic research is considered a fundamental strategy in all scientific work, as it seeks to present, analyze and explain a given subject based on references published in books, magazines and periodicals indispensable in the theoretical construction of the study.

The first stage of the research was based on the survey of references on the subject topic. This search idealized the articles with broad coverage of the topic, whether national or recent. The materials were accessed through digital platforms through the internet.

Following the survey of relevant works, through critical reading, useful information was selected, worked in the form of analyses and abstracts that helped in the final result of the work.

3 DEVELOPMENT

In his studies, Durkheim stated that the cause of suicide is not an individual cause, but a social cause, because according to him, in every society there are subjects willing to suicide, and this must be taken into account not only considering organic-psychic phenomena of the subject or the physical

environment of which that individual is inserted, but also the social causes that generated collective phenomena (DURKHEIM, 2004).

Thus, suicide is seen and explained as a social issue that can vary taking into account how the social interaction of individuals with the society in which they live (DURKHEIM, 2004).

From this, Durkheim classified suicide into three types taking into account the social causes that characterize, they are: selfish suicide, altruistic suicide and anomic suicide. In selfish suicide, the cause is the weakening of the social groups of which individuals are part, the relationship of withdrawal and individualization before the social groups of which the subject, that is, must be understood as a phenomenon in which the individual kills himself by weakening the social groups to which he belongs (DURKHEIM, 2004).

Altruistic suicide, unlike selfish suicide, the subject kills himself for the sake of a greater good for the society or social group of which he is inserted, believing it to be a duty to be fulfilled. The third case, anomic suicide, is the one that is most present in modern society, since it corresponds to a period in which the collective consciousness and moral consciousness are weakened, so this type of suicide is directly related to social issues, that is, the more disturbed this society is, the more incapable the individuals who constitute it become in the role of moralizing (DURKHEIM, 2004).

From these three categorizations exemplified above, it is possible to conclude that suicide is a social phenomenon, being directly linked to the problems that this society faces, directly affecting the subject who is inserted there.

Among the main risk factors associated with suicidal behavior, we can mention physiological, environmental, psychiatric, psychological and existential philosophical problems, and as previously pointed out, due to social and cultural motivations.

It is also necessary to differentiate terms such as self-neglect, self-inflicted injury, ideation, suicidal behavior and completed suicide, since the line that differentiates them is tenuous, because the suicide attempt can be interrupted and that the ideations can arise from stimuli that generate anguish and anxiety, thus resulting in an attempt on one's own life. Still on ideation, it is important to point out that not every thought or desire to die is related to risk factors (WHO, 2014). Although rare, there are suicides in which the act is impulsive, however, studies indicate that there is a planning, a preparation and a history of attempts that follow suicide.

Currently, suicide is considered a public health problem. According to the World Health Organization (WHO), it is estimated that more than 700,000 people die by suicide per year, being among the fourth leading cause of death among young people aged 15 to 29 years (WHO, 2009). Between 2010 and 2019, 112,230 deaths by suicide were recorded in Brazil, with an increase of 43% annually (MINISTRY OF HEALTH, 2021).

The scenario of the pandemic has brought risk factors that are directly linked to the increase in suicide attempts, such as unemployment, grief for a loved one, among other factors. In addition, a study conducted by the World Economic Forum in countries such as Chile, Brazil, Peru and Canada pointed out that people reported worsening in mental health after one year in this pandemic scenario (PAHO, 2021).

As for the rates of suicide attempts, it is estimated that they exceed by ten times more the rates of suicide accomplished, thus being able to compare suicidal behavior with an "iceberg", since a very small proportion comes to knowledge after records in health services. It is estimated that the number of suicide attempts that reach emergency rooms is 2,238 people (WHO, 2002).

Given this, it was necessary to understand what are the public health strategies to deal with the problem, and after a first attempt it is estimated that the risk of a future attempt that may materialize increases (OWENS et al., 2002).

In a research conducted in Fortaleza, Ceará, with 360 victims of suicide attempt attended in services that are part of the Psychosocial Care Network (RAPS), it was possible to understand the need for attentive and specialized professionals about suicidal behavior at all levels of public health and suicide prevention strategies.

The RAPS is part of the Unified Health System (SUS) and the target audience served are people with mental health problems and aims to propose strategies and services of various levels of complexity in order to promote individual rights within social life. The RAPS is composed of services such as CAPS, Therapeutic Residential Services (SRT), Centers of Coexistence and Culture, Reception Units (UA) and comprehensive care beds in General Hospitals and CAPS III.

Despite all this structure of the RAPS, a study conducted in Rio Grande do Norte points out that there are difficulties to access and inadequate functioning in the services offered by the RAPS – especially in the CAPS, due to the high demand of users and the lack of mental health professionals, such as psychiatrists, compromising the effectiveness of the treatment and thus increasing the chances of other hospitalizations in the future as well as suicide. In addition to the structural difficulties, there is also the possibility of encountering non-acceptance and professionals who disbelieve in the suffering that leads to suicide attempts.

In this first moment, it is expected that health professionals perform the welcoming of that patient, thus valuing humanized care, constituting a therapeutic proposal that enhances life. In emergency services in hospitals, it is expected that a rigorous diagnosis is made, in which the first evaluation takes place in the emergency department and an interview in a more isolated and empathetic area to ensure welcoming, and in addition, the patient's family should be heard as well.

In practice, there are several intervention proposals that are used to reduce suicide attempts. It is essential to carry out an evaluation to analyze the risks that may lead to another attempt, since by

making the patient aware of the crisis it can reduce the risks of an attempt in the short, medium and long term (IONITA et al., 2009).

To reduce the chances of attempts, hospitals and/or public health services should train professionals who deal directly with these patients (BALLARD et al., 2008). A study conducted divided patients into three groups according to their needs: the first, being patients hospitalized in psychiatric wards; the second group with patients in intensive care centers and the third group with non-hospitalized patients. In the first group, the needs presented were: lack of psychoeducation strategies to prevent other suicide attempts, professional training and qualified staff for physical treatment and skills for management of the psychiatric ward. In the second group, there was a need for a multidisciplinary team (psychiatrists, psychotherapists and social workers) for immediate and comprehensive care. And in the third group it is necessary to strengthen a support system to inform them about the risks of suicide attempts.

The action of an interdisciplinary network is also necessary to ensure prevention strategies and ensure a comprehensive therapeutic approach, mediating the services and also exercising the interlocutor function, assessing the risks of suicide from demographic characteristics, stressful factors and a psychiatric diagnosis, and a simple structural model used to train teachers can be provided, police officers, religious leaders and health professionals, so this intersectoral team will be attentive to situations of risk of suicide attempt.

The performance of a multisectoral network is crucial in the prevention of suicide behavior, in addition to the partnership and communication between sectors such as health, education, social assistance, public security and guardianship council. Education being a protagonist in the lives of children, adolescents and adults becomes a privileged environment to address mental health and suicide prevention. The strategies that should be adopted in the school context are surveillance, promotion of life and suicide prevention, developing actions that combat prejudice, creation of spaces for dialogue and welcoming, psychoeducation programs that address the theme in a playful way, acting directly and immediately in risk situations. In addition, education professionals should also maintain contact with the parents or guardians of this child or adolescent and, if necessary, referral to health services.

In the social assistance network, through the services offered by the Social Assistance Reference Center (CRAS) and the Specialized Reference Center for Social Assistance (CREAS), they develop actions with the objective of strengthening the development of social skills for conflict resolution, encouraging families to participate in activities offered by society (social, cultural and religious), promoting opportunities in which children and adolescents can reflect and elaborate projects of life and promote activities that work on pertinent topics for discussion. In the case of reception services, the technical reference team should be communicated and together with the educators carry

out the necessary referral, actions should also be conducted that promote dialogues through conversation circles where they have reception and listening.

Public safety professionals should adopt some postures in cases of suicide attempt, and it is often these professionals who give a first service (example Military Brigade and the Fire Department). Welcoming should be done in a humanized way, maintaining calm and control, and not approaching in a repressive way. Referral should be made to mental health services and in situations of risk of other attempts referral to urgent and emergency services (Emergency Care, UPA, SAMU, among others). Guardianship counselors should adopt the same posture as public security professionals, since they deal directly with children and adolescents who have their rights violated.

The same difficulties mentioned above are found in small municipalities that do not meet the requirements for the installation of services offered by the Psychosocial Care Network (RAPS), in which cases of suicide attempts, at first, are referred to the Basic Health Unit (UBS) or to municipal hospitals, and later, to nearby cities that have more resources for the care of these patients.

In a study conducted in a UBS in the municipality of Campo Grande, in the state of Mato Grosso do Sul, it showed the unpreparedness and lack of training of nurses and community health agents for the care of patients with suicide attempts, and the lack of information about suicidal behavior, presenting a stereotyped view of who can present suicidal behavior and having the idea of who attempts suicide is to call the attention of the family, or an act of cowardice for not facing their problems or of courage for attempting suicide. The difficulty presented during this study by the participants is not knowing how to recognize the risk signs of suicidal behavior, thinking that it is a knowledge only of mental health professionals.

4 RESULTS

In a research conducted on several platforms, using the keywords: "Suicide Attempt and Brazil", "Suicide Attempt and Welcoming", "Suicide Attempt and Strategies", "Suicide Attempt and Emergency Services", the articles were found as shown in the table below:

Table 1 – Selected articles

Keyword	Platform	Articles Found	Discarded articles
Suicide attempt and Brazil	SCIELO	13 articles found	12 Discarded articles
Suicide Attempt and Reception	SCIELO	08 articles found	03 Discarded article
Suicide Attempt and Reception	LILACS	03 articles found	02 discarded articles
Suicide Attempt and Strategies	LILACS	29 articles found	25 Discarded articles
Suicide attempt and Basic Health Unit	LILACS	05 articles found	03 Discarded articles
Suicide Attempt and Emergency Services	LILACS	25 articles found	23 Discarded articles

In addition to the articles cited above, the following book was also used as a source for the research. Being it:

Table 2 – Selected books

Title	Author
Suicide	Émile Durkheim

The qualitative criteria for the selection of the articles used for the production of this study refer to the compilation of documents written in the Portuguese language, and that addressed in a targeted way the suicide attempt and the therapeutic proposals in public health services, such as RAPS, CAPS, UBS and emergency services in hospitals. This exclusion was made in this way, in order to keep the research focused on the therapeutic reception after suicide attempt, taking into account the strategies of the Unified Health System, from the level of primary care to the hospital level. Although suicide is a current and extremely important topic, it is possible to notice a certain scarcity in the scientific production related to the researched theme and also the lack of training of health professionals.

The reflection of this phenomenon can be observed in the indexes presented. Brazil is the eighth country among the countries that make up the WHO, presenting an average of 24 suicides per day, but despite this the rates are low, occupying the 73rd place in the world ranking.

According to the WHO (2003), only 25% of suicide attempts enter hospital emergency services, with the most severe cases being referred and treated in an emergency manner to treat the injuries. The Hospital Information System (MINISTRY OF HEALTH, 2014) recorded the number of 153,061 equivalent to hospitalizations for attempted suicide. The worrying thing is that it is estimated that in every three attempts, only one received attention from health services (BOTEGA, 2013).

In 2014, in the Viva-Inquérito (Viva-Survey), the records of care for victims of violence were 4,949, and of this number a percentage of 9.5% were attended for self-harm – it is estimated that 2.9% are children, 18.8% are adolescents, 74.6% are adults and 3.7% are elderly.

Still on the records in the Viva-Survey, it was found that most of the people who were injured were brown/black, about 62.4%, while people of skin color represent a percentage of 34.3%. White women had a higher percentage (39.8%) compared to men (29.4%). The same does not happen with people of brown/black skin color, in which the percentage of men who attempt suicide is higher than women (67.8% for men versus 56.3% for women). In the indigenous population, the records were 1.9% for women and 0.2% for men.

It was noted that the most common means employed are poisoning (53.6%) and use of piercing-cutting objects – in which there is a distinction between sex as well, being more common the suicide attempt of women by poisoning (69.4%) and men by the use of piercing-cutting objects (42.6%).

5 DISCUSSION

Although the theme of suicide is in evidence with the growth of the Yellow September Campaign and with suicidal behavior being addressed in media, such as the series produced and marketed by the streaming platform "13 Reasons Why" (entitled "The Thirteen Whys"), it points out a warning for the problem, especially among adolescents, but for some professionals the series treats the theme irresponsibly and without caution, romanticizing and generalizing suicide as a form of escape, as well as being able to stimulate young people to try to commit the act.

Even with the phenomenon being widely discussed, much of society sees suicide as a "taboo" or a subject that should not be talked about, and with this it is possible to draw a parallel between Durkheim's work "The Suicide" with the present day, in which the author points to suicide as a phenomenon of social and cultural causes – in addition to biological aspects.

As pointed out by Guitierrez (2014), health professionals have a primary role in the face of suicide attempts, since the first reception is essential for the patient's permanence, thus giving the necessary support and helping to find a meaning for life, since a qualified, welcoming and respectful team collaborates not only with the treatment and the best care of the patient and their families, assisting in the post-suicide attempt process, but also in the elaboration of strategies and proposals for action to prevent suicidal behavior.

However, the reality in public health services is very different from what is expected. According to Vidal and Gontijo (2013), most patients who are treated after suicide attempt are discharged without first going through a psychiatrist or psychologist who can assess and if there are risks of recidivism, and after discharge they are not referred for effective monitoring with mental health professionals and there is no family support. When there is referral to mental health services, there is no systematic follow-up to ensure that the patient has adequate support for their demand.

As Owens and others (2002) pointed out that it is necessary to understand what are the public health strategies to deal with suicidal behavior, since it is a growing problem, as the indices previously pointed out according to data from the World Health Organization (WHO), Ministry of Health (MS), Brazilian Institute of Geography and Statistics (IBGE) and Pan American Health Organization (PAHO).

Thus, for effectiveness in therapeutic proposals and suicide prevention strategies, it is necessary to train multisectoral professionals as pointed out by Ionita and others (2009), especially health agents and other professionals in the area who deal directly with patients who enter health services after suicide attempt. The lack of information from professionals who do not have knowledge about mental health causes harm to the reception of patients after suicide attempt, thus not offering humanized and effective care to patients and their families.

6 CONCLUSION

In view of the studies presented, we can conclude that the Unified Health System (SUS) has established ordinances over the years with the objective of guiding and promoting actions to prevent suicidal behavior, serving as a basis for conduct expected by health professionals. The RAPS is a good example of the therapeutic proposal for cases of suicide attempts, since it is composed of teams that constitute services such as Family Health, Living Centers, Basic Health Units (UBS, SAMU, UPA), Family Health Support Centers and Psychosocial Care Centers, and in addition to this network there are also emergency services and comprehensive care beds in hospitals that also offer care and Reception of patients who are admitted after suicide attempt.

Considering that suicide is a social phenomenon, intersectoral prevention strategies are also necessary, in addition to those proposed by health services. Education becomes a conducive environment to promote strategies and actions aimed at preventing suicidal behavior and informing about mental health. Social assistance also plays an important role in the prevention of suicide attempts, considering that it deals directly with social vulnerabilities and inequalities such as political and economic instability, family and domestic violence, neglect, abandonment or homelessness, abusive use of alcohol and other chemical substances, fragile family ties and unemployment.

Public safety professionals and guardianship counselors also have an important role in the prevention of suicide, since in some cases these professionals are the first to attend these people and their families, and this first reception is fundamental, in case of guardianship counselors they are the ones who perform the first care for children and adolescents involving self-injury.

Therefore, it is a work that goes far beyond the scope of health, but that demands attention and action in the different sectors of society, with a view to minimizing this social problem.

REFERENCES

APÓS 18 meses de pandemia de COVID-19, OPAS pede prioridade para prevenção ao suicídio. OPAS: Organização Pan-Americana da Saúde, 9 de setembro de 2021. Disponível em: < https://www.paho.org/pt/noticias/9-9-2021-apos-18-meses-pandemia-covid-19-opas-pede-prioridade-para-prevencao-ao-suicidio > Acesso em: 30 de abril de 2022.

BAHIA, Camila Alves et al. Lesão autoprovocada em todos os ciclos da vida: perfil das vítimas em serviços de urgência e emergência de capitais do Brasil. Ciência & Saúde Coletiva, v. 22, p. 2841-2850, 2017.

BASTOS, Gustavo. O pai da suicidologia. Século Diário, 05 de novembro de 2020. Disponível em: < https://www.seculodiario.com.br/colunas/o-pai-da-suicidologia/ > Acesso em: 30 de abril de 2022.

BOTEGA, Neury José. Comportamento suicida: epidemiologia. Psicologia Usp, v. 25, p. 231-236, 2014.

BRASIL. Ministério da Saúde. Secretaria de Vigilância em Saúde. Saúde Brasil 2014: uma análise da situação de saúde e das causas externas. Brasília: Ministério da Saúde, 2015. Disponível em: < https://bvsms.saude.gov.br/bvs/publicacoes/saude_brasil_2014_analise_situacao.pdf > Acesso em: 16 de maio de 2022.

COSTA, Paula Cristina Pereira da; GARCIA, Ana Paula Rigon Francischetti; TOLEDO, Vanessa Pellegrino. Acolhimento e cuidado de enfermagem: um estudo fenomenológico. Texto & Contexto-Enfermagem, v. 25, 2016.

CORREIA, Cíntia Mesquita et al. Atenção psicossocial às pessoas com comportamento suicida na perspectiva de usuários e profissionais de saúde. Revista da Escola de Enfermagem da USP, v. 54, 2020.

DE ALMEIDA, Felipe Mateus. O suicídio: Contribuições de Émile Durkheim e Karl Marx para a compreensão desse fenômeno na contemporaneidade. Revista Aurora, v. 11, n. 1, p. 119-138, 2018.

DE FREITAS, Ana Paula Araújo; BORGES, Lucienne Martins. Do acolhimento ao encaminhamento: O atendimento às tentativas de suicídio nos contextos hospitalares. Estudos de Psicologia, v. 22, n. 1, p. 50-60, 2017.

DE REZENDE ROCHA, Francielle; ALVARENGA, Marcia Regina Martins; GIACON-ARRUDA, Bianca Cristina Ciccone. Impacto da intervenção educacional sobre suicídio na percepção de enfermeiras e agentes comunitários de saúde. SMAD, Revista Eletrônica Saúde Mental Álcool e Drogas (Edição em Português), v. 16, n. 4, p. 13-22, 2020.

DURKHEIM, Émile. O suicídio: estudo de sociologia. São Paulo: Martins Fontes, 2000.

GARBIN, Clea Adas Saliba et al. A operacionalização do SUS na prevenção e condução de casos de suicídios: análise documental. Revista Ciência Plural, v. 5, n. 2, p. 129-142, 2019.

GUTIERREZ, Beatriz Aparecida Ozello. Assistência hospitalar na tentativa de suicídio. Psicologia Usp, v. 25, p. 262-269, 2014.

HECK, Rita Maria et al. Ação dos profissionais de um centro de atenção psicossocial diante de usuários com tentativa e risco de suicídio. Texto & Contexto-Enfermagem, v. 21, p. 26-33, 2012.

MACCHIAVERNI, Juliana; BORGES, Lucienne Martins; OLIVEIRA, Lecila Duarte Barbosa. Instrumento para registro de atendimento psicológico a tentativas de suicídio. Barbarói, p. 129-148, 2013.

MEIRA, Saulo Sacramento et al. Representações sociais de profissionais de emergência sobre prevenção de readmissões hospitalares por tentativa de suicídio. Trabalho, Educação e Saúde, v. 18, 2020.

MOUTIER, Christine. Comportamento suicida. Manual MSD, julho de 2021. Disponível em: < https://www.msdmanuals.com/pt/casa/distúrbios-de-saúde-mental/comportamento-suicida-e-automutilação/comportamento-suicida > Acesso em: 30 de abril de 2022.

NUNES, Nandara Rocha; FREIRE, William Fernandes; PORFIRIO, Regiane Baptista Martins. Acolhimento da equipe de enfermagem frente aos adolescentes com ideações suicidas: uma revisão integrativa de literatura. Revista Científica Multidisciplinar Núcleo do Conhecimento. Disponível em: < https://www.nucleodoconhecimento.com.br/saude/ideacoes-suicidas/ > Acesso em: 30 de abril de 2022.

UMA em cada 100 mortes ocorre por suicídio, revelam estatísticas da OMS. OPAS: Organização Pan-Americana da Saúde, 17 de junho de 2021. Disponível em: < https://www.paho.org/pt/noticias/17-6-2021-uma-em-cada-100-mortes-ocorre-por-suicidio-revelam-estatisticas-da-oms > Acesso em: 30 de abril de 2022.

Rio Grande do Sul. Comitê Estadual de Promoção da Vida e Prevenção do Suicídio do Estado do Rio Grande do Sul; Comissão da Criança e do Adolescente. Guia Intersetorial de Prevenção do Comportamento Suicida em Crianças e Adolescentes. p. 13-32, 2019. Disponível em: < https://saude.rs.gov.br/upload/arquivos/carga20190837/26173730-guia-intersetorial-de-prevencao-do-comportamento-suicida-em-criancas-e-adolescentes-2019.pdf > Acesso em: 13 de outubro de 2022.

VIDAL, Carlos Eduardo Leal; GONTIJO, Eliane Dias. Tentativas de suicídio e o acolhimento nos serviços de urgência: a percepção de quem tenta. Cadernos Saúde Coletiva, v. 21, p. 108-114, 2013.

Deaths and accidents: Analysis of deaths from occupational accidents in Brazil from 2012 to 2019

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ABSTRACT

Introduction: Work accidents are a major public health problem, Brazil occupies the fourth place in the world ranking of fatal work accidents. It is estimated that there are about 318 thousand deaths in the world, caused by occupational accidents, as well as 2 million diseases related to accidents. Objective: To analyze deaths from occupational accidents recorded in Brazil, identifying and describing their epidemiological profile from 2012 to 2019. Method: Cross-sectional epidemiological study of deaths from occupational accidents recorded in the Mortality Information System (SIM) of Brazil, from 2012 to 2019, analyzed in Microsoft Excel 2019® and the R 4.0.2 software. Results: There were 27,510 deaths due to occupational accidents, with a decreasing trend in the mortality rate; most of which occurred in the Southeast region (33.44%), in males (94.27%), in the age group between 30-39 years (24.06%), whites (49.43%), schooling (29.92%) of the individuals who evolved to death had from 8 to 11 studies, regarding the place of occurrence of occupational accidents (33.73%) of the deaths occurred in the hospital. Conclusion: It is evident the need for surveillance actions in workers' health, training, continuous training and public policies to cope with social determinants and conditioning, with the objective of reducing occupational accidents and consequently deaths.

Keywords: Deaths, Workers' health, Occupational health surveillance.

1 INTRODUCTION

Work accidents are considered a major public health problem in the world, and in Brazil it occupies the fourth place in the world *ranking* of fatal work accidents, second only to Russia, the United States and China (BATISTA *et al*., 2019; ILO, 2013).

The fatal work accident is considered any death that occurred immediately after its occurrence or, subsequently, since the basic, immediate or intermediate cause of death is due to the accident (MINISTÉRIO DA SAÚDE, 2006).

It is estimated that there are about 318 thousand deaths in the world, caused by occupational accidents, as well as 2 million diseases related to accidents. Deaths from these accidents can cause social and psychological damage to the victims' families, directly reflecting on quality of life and social life (NERY *et al.*, 2022).

According to the Observatory of Safety and Health at Work from 2012 to 2022, in Brazil, there were 6.7 million occupational accidents and 25,500 deaths of workers with a formal contract.

Most countries do not have standardized sources of information on occupational diseases and occupational accidents and those with low to middle income show higher rates of underreporting (HAMALAINEN, 2009). However, according to Chagas (2011), Brazil has been showing improvement in its quality and data coverage, although its use for studies and surveillance is still considered incipient when compared to other themes.

Research shows that the availability of data on occupational accidents is not so well known, they have the limitation of not being simultaneously recorded by all information systems, requiring integration between them. This question highlights a methodological problem, of data accuracy and, mainly, political and social. It is necessary to understand that the levels of health care and social protection is paramount to refine the policies of prevention, promotion, attention to diseases and surveillance in occupational health (RODRIGUES *et al*., 2019; FACCHINI, 2005).

Still in this context, it is essential to record information for proper planning and management, given that every death resulting from a preventable disease portrays failures in the policies and programs of its control (RODRIGUES *et al*., 2019). Thus, this research aims to contribute to a greater knowledge about deaths from occupational accidents recorded in Brazil, identifying and describing their epidemiological profile in the period from 2012 to 2019.

2 METHODOLOGY

This is a cross-sectional epidemiological study of deaths from occupational accidents recorded in the Mortality Information System (SIM) of Brazil, in the period from 2012 to 2019.

To characterize the epidemiological profile of deaths due to occupational accidents, the mortality rate for each year analyzed was calculated, multiplying the coefficient by the base of 100,000

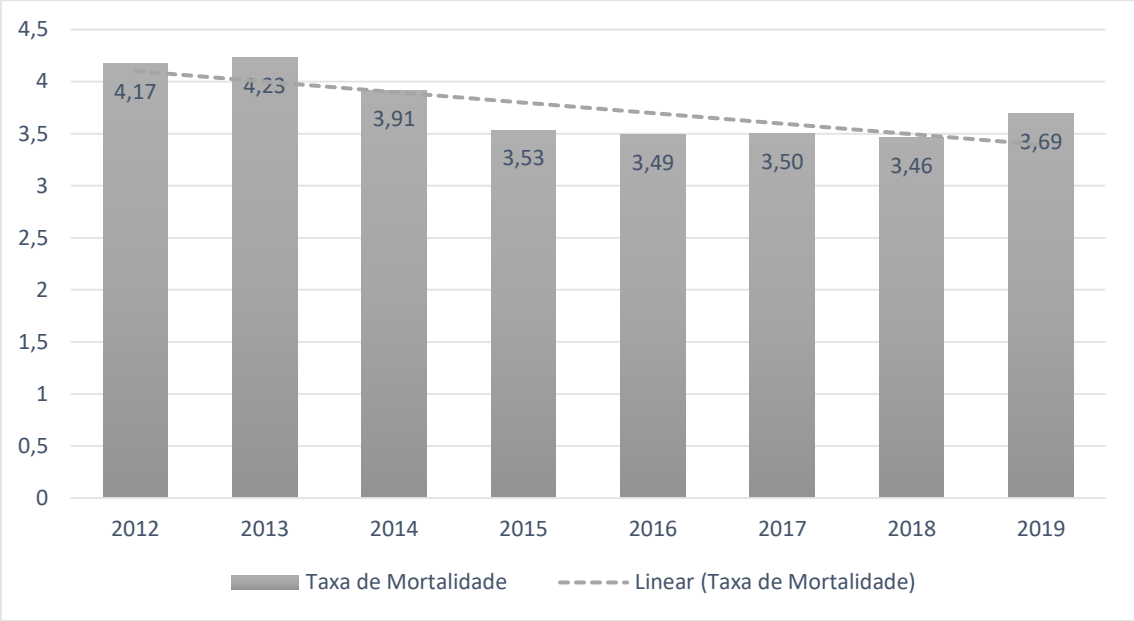
thousand inhabitants (inhab.). In the statistical analysis, the absolute (n) and relative (%) frequency of the variables were calculated by region of residence, sex, race/color, age group, education and place of occurrence of the accidents. For all tests performed, a statistical significance of 5% ($p<0.05$) was adopted. Data were analyzed using Microsoft Excel 2019® spreadsheets and R 4.0.2 software.

Regarding the approval of the Research Ethics Committee, the study did not require to use data from the public domain, according to Resolution No. 510/2016 of the National Health Council (BRASIL, 2016)

3 FINDINGS

In Brazil, between 2012 and 2019, 27,510 deaths from occupational accidents were reported. There was a downward trend in the mortality rate in the years 2014, 2015, 2016 and 2018 and maintenance of the upward trend in cases in 2013, 2017 and 2019. In addition, it was observed that in 2013 it stood out with the highest mortality rate (4.23/100 thousand inhab.) and the year 2018 with the lowest (3.46/100 thousand inhab.) (Figure 1).

Figure 1- Mortality rate of deaths from occupational accidents in Brazil, from 2012 to 2019.



Source: Prepared by the authors. Data extracted from the Mortality Information System (SIM).

In the analysis by geographic region in Brazil, it was noted that deaths due to occupational accidents showed a higher increase in the Southeast (33.44%), followed by the South (26.23%), Northeast (15.82%), Midwest (12.40%) and North (12.11%). Regarding gender, 94.27% of the deaths occurred in males, mainly in people aged 30-39 years (24.06%), followed by 40-49 (22.18%), 20-29 (19.79%), 50-59 (17.81%) and 60 years and over (12.01%) (Table 1).

Regarding race/color, most deaths occurred in individuals with white race/color (49.43%), mulatto (42.54%) and black (5.93%). For schooling, 29.92% of the individuals who progressed to death had 8 to 11 studies, followed by 4 to 7 years (26.56%), ignored (20.63%), 1 to 3 (14.17%), 12 years and more (5.18%) and none (3.53%). Regarding the place of occurrence, 33.73% of the deaths occurred in the hospital, followed by public roads (32.52%), others (27.55%) and home (4.08%) (Table 1).

As for the percentage variation of deaths, between 2012 and 2013 there was an increase of 3.26% in deaths. Already in 2013 to 2014, there was a decrease of 6.54% of deaths, occurring consecutive decreases in the following years until 2017, which compared to 2016, fatal cases increased by 2.36%. From 2017 to 2018, deaths fell again by 0.03%, however, between 2018 and 2019 there was a new increase of 8.66%. In an analysis during the entire period, 2012-2019, a decrease in deaths (-6.89%) was observed (Table 1).

By geographic region (2012-2019), it was noted that the North has the highest increase (14.40%) in deaths, while the Midwest region had the largest decrease (-22.49%), followed by the Northeast (-16.39%), South (-4.93%) and Southeast (-4.43%) (Table 1).

Table 1 - Characterization of deaths related to occupational accidents in Brazil, 2012-2019.

Variables	2012		2013		2014		2015		2016		2017		2018		2019		Total		P-value	Percentage Change - Δ% - 2012-2019
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
Region of Residence																				
North	389	11,67	457	13,72	422	12,67	348	10,44	365	10,95	461	13,84	445	13,36	445	13,36	3.332	12,11	< 0.01	14,40%
Northeast	592	13,60	622	14,29	624	14,33	517	11,88	476	10,93	491	11,28	536	12,31	495	11,37	4.353	15,82	< 0.01	-16,39%
Southeast	1.332	14,48	1.301	14,14	1.157	12,58	1.053	11,45	1.005	10,93	1.043	11,34	1.035	11,25	1.273	13,84	9.199	33,44	< 0.01	-4,43%
On	934	12,95	1.025	14,21	922	12,78	885	12,27	876	12,14	854	11,84	831	11,52	888	12,31	7.215	26,23	< 0.01	-4,93%
Central-West	498	14,60	462	13,54	489	14,34	439	12,87	414	12,14	361	10,58	362	10,61	386	11,32	3.411	12,40	< 0.01	-22,49%
Gender																				
Male	3.556	13,71	3.663	14,12	3.428	13,22	3.052	11,77	2.950	11,38	3.012	11,61	3.023	11,66	3.250	12,53	25.934	94,27	< 0.01	-8,61%
Female	188	11,99	202	12,88	186	11,86	189	12,05	186	11,86	198	12,63	184	11,73	235	14,99	1.568	5,70	< 0.01	25,00%
Ignored	1	12,50	2	25,00	-	0,00	1	12,50	-	0,00	-	0,00	2	25,00	2	25,00	8	0,03	< 0.01	100,00 %
Age group																				
Minor 1 year	3	25,00	1	8,33	2	16,67	2	16,67	-	0,00	2	16,67	1	8,33	1	8,33	12	0,04	< 0.01	-66,67%
1 to 4 years	2	9,52	3	14,29	1	4,76	3	14,29	2	9,52	5	23,81	3	14,29	2	9,52	21	0,08	< 0.01	0,00%
5 to 9 years	5	23,81	4	19,05	1	4,76	3	14,29	4	19,05	2	9,52	-	0,00	2	9,52	21	0,08	< 0.01	-60,00%
10 to 14 years	6	10,17	15	25,42	14	23,73	8	13,56	5	8,47	3	5,08	6	10,17	2	3,39	59	0,21	< 0.01	-66,67%

15 to 19 years	162	16,63	167	17,15	133	13,66	128	13,14	89	9,14	107	10,99	91	9,34	97	9,96	974	3,54	< 0.01	-40,12%
20 to 29 years	830	15,25	882	16,20	765	14,05	606	11,13	593	10,89	574	10,55	579	10,64	614	11,28	5.443	19,79	< 0.01	-26,02%
30 to 39 years	938	14,17	897	13,55	895	13,52	789	11,92	721	10,89	783	11,83	761	11,50	835	12,62	6.619	24,06	< 0.01	-10,98%
40 to 49 years	828	13,57	854	13,99	743	12,17	722	11,83	726	11,90	686	11,24	721	11,81	823	13,49	6.103	22,18	< 0.01	-0,60%
50 to 59 years	635	12,91	590	12,00	643	13,08	608	12,37	592	12,04	620	12,61	601	12,22	628	12,77	4.917	17,87	< 0.01	-1,10%
60 years and over	330	9,99	446	13,50	411	12,44	366	11,08	402	12,17	428	12,96	441	13,35	479	14,50	3.303	12,01	< 0.01	45,15%
Age ignored	6	15,79	8	21,05	6	15,79	7	18,42	2	5,26	-	0,00	5	13,16	4	10,53	38	0,14	< 0.01	-33,33%
Color/race																				
White	1.901	13,98	1.928	14,18	1.760	12,94	1.583	11,64	1.650	12,14	1.571	11,55	1.552	11,41	1.652	12,15	13.597	49,43	< 0.01	-13,10%
Black	227	13,93	234	14,36	208	12,76	190	11,66	179	10,98	205	12,58	183	11,23	204	12,52	1.630	5,93	< 0.01	-10,13%
Yellow	15	20,83	15	20,83	5	6,94	7	9,72	4	5,56	3	4,17	10	13,89	13	18,06	72	0,26	< 0.01	-13,33%
Pardon	1.504	12,85	1.606	13,72	1.555	13,29	1.407	12,02	1.258	10,75	1.379	11,78	1.427	12,19	1.568	13,40	11.704	42,54	< 0.01	4,26%
Indigenous	4	7,14	8	14,29	12	21,43	5	8,93	5	8,93	10	17,86	7	12,50	5	8,93	56	0,20	< 0.01	25,00%
Ignored	94	20,84	76	16,85	74	16,41	50	11,09	40	8,87	42	9,31	30	6,65	45	9,98	451	1,64	< 0.01	-52,13%
Schooling																				
No	132	13,59	151	15,55	131	13,49	92	9,47	120	12,36	115	11,84	123	12,67	107	11,02	971	3,53	< 0.01	-18,94%
1 to 3 years	569	14,60	569	14,60	575	14,75	490	12,57	449	11,52	455	11,67	405	10,39	386	9,90	3.898	14,17	< 0.01	-32,16%
4 to 7 years	947	12,96	1.029	14,08	971	13,29	874	11,96	907	12,41	841	11,51	824	11,28	915	12,52	7.308	26,56	< 0.01	-3,38%
8 to 11 years	988	12,00	1.003	12,18	993	12,06	914	11,10	950	11,54	1.053	12,79	1.058	12,85	1.273	15,46	8.232	29,92	< 0.01	28,85%
12 years and over	196	13,75	177	12,42	155	10,88	151	10,60	162	11,37	161	11,30	162	11,37	261	18,32	1.425	5,18	< 0.01	33,16%
Ignored	913	16,09	938	16,53	789	13,90	721	12,70	548	9,65	585	10,31	637	11,22	545	9,60	5.676	20,63	< 0.01	-40,31%
Local Occurrence																				
Hospital	1.270	13,69	1.320	14,22	1.204	12,97	1.072	11,55	1.112	11,98	1.109	11,95	1.106	11,92	1.087	11,71	9.280	33,73	< 0.01	-14,41%
Other health facility	62	11,95	73	14,07	60	11,56	72	13,87	70	13,49	54	10,40	63	12,14	65	12,52	519	1,89	< 0.01	4,84%
Domicile	136	12,12	159	14,17	148	13,19	123	10,96	134	11,94	137	12,21	142	12,66	143	12,75	1.122	4,08	< 0.01	5,15%
Public road	1.301	14,54	1.301	14,54	1.264	14,13	1.039	11,61	1.013	11,32	1.018	11,38	1.026	11,47	984	11,00	8.946	32,52	< 0.01	-24,37%
Other	960	12,67	1.001	13,21	920	12,14	932	12,30	804	10,61	886	11,69	870	11,48	1.206	15,91	7.579	27,55	< 0.01	25,63%
Ignored	16	25,00	13	20,31	18	28,13	4	6,25	3	4,69	6	9,38	2	3,13	2	3,13	64	0,23	< 0.01	-87,50%
Total	**3.745**	**13,61**	**3.867**	**14,06**	**3.614**	**13,14**	**3.242**	**11,78**	**3.136**	**11,40**	**3.210**	**11,67**	**3.209**	**11,66**	**3.487**	**12,68**	**27.510**	**100,00**	**< 0.01**	**-6,89%**

Source: Mortality Information System (SIM). Prepared by the authors.

4 DISCUSSION

The findings of the present study demonstrate a decrease in deaths due to occupational accidents in the total study period in Brazil. Although the results allow us to observe such a decrease

in deaths, there are peaks of growth in certain years, as well as disparities in relation to the regions of the country, sex, age group, ethnic-racial characteristics, schooling and place of occurrence.

The decline in mortality estimates can be explained by the influence of the type of economic activity developed. The increase in the insertion of workers in the tertiary sector, trade and service activities, which offer a lower risk of accidents, improvement of working conditions, better rates of schooling and qualification of workers can impact on this decrease over the years (FERREIRA-DE-SOUSA; SANTANA, 2016; ALMEIDA; MORRONE; RIBEIRO, 2014).

Millions of people in the world die as a result of accidents at work. In Brazil, a study conducted in 2018 showed that the number of deaths in the country is high, in 2013 there were more than 2,500 deaths from occupational accidents. Whose region with the highest number of cases and deaths was the South, with 158,113 and 1,879, respectively (POSSEBOM; ALONÇO, 2018).

With regard to the Brazilian regions, it was observed in this study that the regions identified with the highest deaths were the Southeast and South, which corroborates with the studies by Malta et al., (2017) and Possebom; Alonço (2018), which show a higher frequency of these accidents in the Southeast, Northeast and South regions. The Northeast region occupied the third place in the numbers of deaths and the North the last. These results corroborate the study by Mascarenhas et al., (2015) who demonstrate lower numbers of work accidents in these regions, since such data coincide with the economic growth of the country, in which regions with a higher level of development (South and Southeast) have higher proportions of work-related accidents, due to the higher concentration of industries, and consequently manpower.

Regarding sociodemographic variables, the male sex prevailed, a data that corroborates the studies of Rankings (2020) that presented 85.6% in the male sex, as well as Cardim and Reis (2016), which showed that 96.2% of the workers who died were male. This may be related to the fact that men are more present in the productive sectors that present higher risks for fatal accidents, such as civil construction and transportation (MENEGON; MENEGON; KUPEK, 2021)

Regarding race/color, white prevailed with a considerably higher number, according to the study by Menegon and Kupek (2021), in which 17,290 (52%) of deaths occurred with white workers in Brazil, and in 2015, the mortality rate was 3.61/100 thousand in whites, 2.05/100 thousand among blacks and 3.37/100 thousand among browns.

Regarding the age group, it was observed that people aged between 20 and 49 years had a higher number of records for work accidents, which corroborates the study by Mascarenhas et al., (2015) who demonstrated a higher prevalence of occupational accidents in people between 30 and 59 years old in the capitals of Brazil.

In education, most deaths occurred in people with schooling between 8 to 11 studies, followed by 4 to 7 years, which reinforces the results of studies previously exposed by Cardim and Reis (2016),

with about 15.4% of workers who evolved to death had between 4 and 11 years of study. Corrêa et al., (2017), stated that those who have less than twelve years of education suffer more work accidents. Moreover, more than 60% of the workers who are present in informal work have a low level of education, that is, the higher the schooling, the better the insertion in the labor market and the lower the risks of fatal occupational accidents (MENEGON; MENEGON; KUPEK, 2021).

Regarding the place of occurrence of deaths, they occurred mainly in hospitals, which corroborates with the studies of Batista et al., (2019), which showed that hospital care activities present an ascending indication of work accidents, due to the issue of the activities developed in this sector require greater physical contact with infectious agents and piercing cutting instruments.

It is noteworthy that occupational accidents are preventable and predictable, that is, the deaths resulting from these accidents may reflect the violence felt, negligence of the employer, which may be associated with the authoritarian power relationship in order to increase productivity and profit (NERY *et al.*, 2022).

As limitations of this study, we can consider the absence of data due to issues of underreporting in the available records that could aggregate for greater accuracy in the study, such as in the variable age group and race/color (ignored). In addition, there is a need for more research that addresses this theme in order to add scientific knowledge to support the health surveillance of workers, the fiscal auditors of the Ministry of Labor and Social Security and the Public Ministry of Labor.

Although there has been an advance in the coverage of SIM (BRASIL, 2013), the problem of under-reporting of cases is still faced. Although this system offers information on formal and informal workers, it is common not to identify the work in death due to external causes, especially when it comes to informal workers (NOBRE; CARVALHO; KATO, 2010).

Finally, the results of this current study are important, as they show a decreasing trend in deaths from occupational accidents in Brazil in the period 2012-2019, and identify peaks of increase in deaths. In addition, it was noted that deaths due to occupational accidents in Brazil have established population groups such as men, white, brown with schooling from 8 to 11 years and who reside in the South, Southeast and Northeast regions, where there is a concentration of the main focuses of informal work.

Thus, the need for surveillance actions in workers' health, training, continuous training and public policies to cope with social determinants and conditioning factors is evidenced, with the objective of reducing occupational accidents and consequently deaths. As well, there is a need to fill out the notification forms properly, in order to subsidize actions to improve working conditions, reduce the risks of accidents and provide better safety conditions to workers' health.

REFERENCES

ALMEIDA, F.S.S, MORRONE, L.C ; RIBEIRO K.B. Tendências na incidência e mortalidade por acidentes de trabalho no Brasil, 1998 e 2008. Cad Saude Publica 2014; 30(9):1957-1964.

BATISTA, A.G; SANTANA, V.S; FERRITE, S.. Registro de dados sobre acidentes de trabalho fatais em sistemas de informação no Brasil. Ciência & Saúde Coletiva, v. 24, p. 693-704, 2019.

BRASIL. Ministério da Saúde (BR), Secretaria de Atenção à Saúde, Departamento de Ações Programáticas Estratégicas. Notificação de acidentes do trabalho fatais, graves e com crianças e adolescentes [Internet]. ; 2006

BRASIL. Ministério Público do Trabalho. Observatório de Segurança e Saúde no Trabalho [internet]. 2020 [acesso em 2023 jul 27]. Disponível em: https://smartlabbr.org/sst/localidade/4104808.

BRASIL. Resolução nº 510, de 07 de abril de 2016. Dispõe sobre as normas aplicáveis a pesquisas em Ciências Humanas e Sociais. Diário Oficial [da] República Federativa do Brasil, Brasília, DF, 24 maio 2016. Disponível em: <Disponível em: http://bit.ly/2fmnKeD >. Acesso em: 06 set. 2022.

CARDIM, A.; PESSOA DOS REIS, A. L. P. MORTALIDADE POR ACIDENTES DE TRABALHO NA MACRORREGIÃO EXTREMO SUL DA BAHIA. Revista Enfermagem Contemporânea, v. 5, n. 2, 2016. DOI: 10.17267/2317-3378rec.v5i2.1098.

CHAGAS, A.M.R; SERVO, L.M.S; SALIM, C.A. Indicadores da saúde e segurança no trabalho: fontes de dados e aplicações. In: Instituto de Pesquisa Econômica Aplicada (IPEA). Saúde e Segurança no Brasil: aspectos institucionais, sistemas de informação e indicadores. Brasília: IPEA; 2011. p. 289-328

CORRÊA, L.B.D. *et al*. Fatores associados ao uso de equipamentos de proteção individual por profissionais de saúde acidentados com material biológico no Estado do Maranhão. Rev Bras MedTrab.,2017; 15: 340-9.

FACCHINI, L.A. Sistema de informação em saúde do trabalhador: desafios e perspectivas para o SUS. Ciência & Saúde Coletiva 2005; 10(4):857-867.

FERREIRA, D. N.S., et al. Acidentes de trabalho no Brasil: revisão bibliográfica no âmbito hospitalar. Cadernos de aula do LEA. n.6, 2017.

FERREIRA-DE-SOUSA, F. N.; SANTANA, V. S.. Mortalidade por acidentes de trabalho entre trabalhadores da agropecuária no Brasil, 2000-2010. Cadernos de Saúde Pública, v. 32, n. 4, p. e00071914, 2016.

GOMEZ, C. M.; VASCONCELLOS, L. C. F. DE .; MACHADO, J. M. H.. Saúde do trabalhador: aspectos históricos, avanços e desafios no Sistema Único de Saúde. Ciência & Saúde Coletiva, v. 23, n. 6, p. 1963–1970, jun. 2018.

HAMALAINEN,P. The effect of globalization on occupational accidents. Saf Sci [Internet]. 2009 [citado em 22 mar 2023];47(6):73342. Disponível em: http://www.sciencedirect.com/science/article/pii/S0925753508000301

MALTA, D.C. *et al.*. Acidentes de trabalho autorreferidos pela população adulta brasileira, segundo dados da Pesquisa Nacional de Saúde, 2013. Ciência & saúde coletiva . 2017Jan;22(1):169–78. Available from: https://doi.org/10.1590/1413-81232017221.17862015

MASCARENHAS, M.D.M. *et al*. Atendimentos de emergência por lesões relacionadas ao trabalho: características e fatores associados – Capitais e Distrito Federal, Brasil, 2011. Ciência & Saúde Coletiva, 20(3):667-678, 2015.

MENEGON, L. da S; MENEGON, F.A; KUPEK, E. Mortalidade por acidentes de trabalho no Brasil: análise de tendência temporal, 2006-2015. Revista Brasileira de Saúde Ocupacional, v. 46, p. 1-15, mar. 2021. FapUNIFESP (SciELO). http://dx.doi.org/10.1590/2317-6369000025219.

NERY, F. S. D. *et al*. Tendência temporal dos anos potenciais de vida perdidos por acidentes de trabalho fatais segundo raça/cor da pele na Bahia, 2000-2019. Revista Brasileira de Saúde Ocupacional, [S.L.], v. 47, p. 1-10, 2022. FapUNIFESP (SciELO). http://dx.doi.org/10.1590/2317-6369/18719pt2022v47e1.

OBSERVATÓRIO DIGITAL DE SAÚDE E SEGURANÇA NO TRABALHO. 2019, on-line.Disponível em: https://smartlabbr.org/sst.

OIY-Organización Internacional del Trabajo. La prevención de las enfermedades profesionales. Geneva; 2013.

POSSEBOM, G ; ALONÇO A.S. Panorama dos acidentes de trabalho no Brasil. Nucleus [internet]. 2018 [acesso em 2020 jan 30]; 15(2):15-22. Disponível em: http:// nucleus.feituverava.com.br/index.php/nucleus/article/view/2691.

RODRIGUES, A. B; SANTANA, V. S. Acidentes de trabalho fatais em Palmas, Tocantins, Brasil: oportunidades perdidas de informação. Revista Brasileira de Saúde Ocupacional, v. 44, 2019.

Oral health education in schools as a form of public health promotion

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ABSTRACT
INTRODUCTION: Brazil has reduced the rates of oral diseases, but a large part of the population has caries or other periodontal diseases, evidencing the need for intensified education on oral health. The reduction of rates occurred with the creation of programs and policies focused on the theme. In order to obtain a better view of the health condition of schoolchildren in Brazil, the development of PeNSE was carried out, which identifies the risk and protective factors for students' health. METHOD: This study is a reflective theoretical essay based on the theme of Primary Health Care, its theoretical foundation from the national and international scientific literature and the critical analysis of the authors. Thus, the reflection on the theme and its explanations will be the guiding axis on the subject. As there was no interaction of direct/applied research, the need to submit the study to ethical procedures was excluded.
DISCUSSION: Due to the correlation between health and education, the school is the best environment to treat issues related to oral health. To facilitate approaches to health in schools, the School Health Program (PSE) was created. Educators can be great contributors in the promotion of oral health, due to the daily contact with students. However, some teachers may not have the necessary training to pass updated knowledge on the subject to students, requiring the permanent and continuing education of these professionals in partnership with the dentist. FINAL CONSIDERATIONS: For there to be an effective oral health promotion for students, it is important that the area of health and education are integrated so that one adds to the other. Teachers should disseminate information and health professionals should train educators, since they have technical and scientific knowledge on the subject.

Keywords: Education, Health Promotion, Oral Health.

1 INTRODUCTION

Oral health is a right guaranteed by law for all Brazilians. It is important not only for oral changes, but is also related to poor nutrition, dental infections and other problems that can negatively impact the individual's life (Brasil, 2016).

Brazil, despite having reduced the rates of oral diseases, has a large part of the population presenting caries or other periodontal diseases. This information highlights the need to intensify and reinforce oral health education in order to influence oral hygiene (Rossi and Gonçalves, 2022).

Since the end of the 90's there are state plans related to this theme to take care of the health of the population. The Smiling Brazil Program (PBS) is one of them, created with the objective of ensuring the realization of actions to promote, prevent and recover the oral health of Brazilians (Rossi and Gonçalves, 2022).

Since education and health are interconnected, the school is the best environment to deal with issues related to health, especially oral health. For the integration of these two sectors, the School Health Program (PSE) was created, whose main audience is Basic Education students. Health promotion aims to encourage young people to seek a healthier lifestyle (Rossi and Gonçalves, 2022).

Consonant with this, in order to have better attention to this area, the Brazilian Institute of Geography and Statistics (IBGE) in partnership with the Ministry of Health and support from the Ministry of Education developed the Health in Schools Survey (PeNSE), which occurs every three years and aims to identify the risk factors and health protection of students from public and private schools in Brazil, the results evidenced are used to create National Oral Health Policies (PNSB) (Nery, et al., 2019).

Thus, keeping these data updated contributes to a better health care related to the health of the schoolchild and helps in axes such as oral health. The promotion of oral health in schools helps in the creation of hygiene habits of the individual and also contributes to the modification of family and community habits in general, reducing negative health customs (Pereira et al., 2017; Oliveira et al., 2018).

2 DISCUSSION

2.1 EDUCATION AND ORAL HEALTH

It is notorious that education is a preponderant mechanism in any and all areas, since the horizons of knowledge are broadened, causing ordinary people to acquire knowledge that they are not familiar with, and that could be part of their daily lives, improving the quality of their lives (Castro et al., 2012).

When we talk about education and health, we talk about the basic needs of the individual, not for nothing, they make up the relationship of fundamental human rights and are among the main objectives of sustainable development according to the UN 2030 agenda, and they are interconnected, since education is the basis for a healthy life (Carneiro et al., 2020).

Brazil has already been among the countries with the highest rates of oral diseases, but despite the reduction of these diseases, through various actions, it is still verified that a large part of the population has caries or some type of periodontal disease. Thus, oral health activities in schools need to be maintained and intensified so that they continue to contribute to the gain of knowledge on the subject, influencing oral hygiene attitudes (Oliveira et al., 2018; Pacheco et al., 2018).

A major challenge when talking about health promotion in the school environment is the connection between the health and education sectors, in order to develop a pedagogical routine to carry out promotion, prevention and curative activities in the teaching environment (Pereira et al., 2017). For this, an agreement must be made between the health and education secretariats in order to develop actions to promote permanent and continuing education for teachers, parents and students (Oliveira et al., 2018).

According to Brazilian legislation, health promotion actions should occur in order to encourage people to acquire a healthier lifestyle, and education has a prominent role, including in the intellectual improvement of the individual, leading him to point out that the best place to learn and reinforce concepts and good health habits is in schools (Oliveira et al., 2018).

In this context, oral health as a public policy plays an essential role in maintaining health, not only due to oral dysfunctions, but also due to the relationship with malnutrition, infections, late dental eruptions, among others, which negatively impact the quality of life of students (Oliveira et al., 2018).

2.2 NATIONAL ORAL HEALTH POLICY AS A STATE POLICY

In May 2023, with the federal decree of bill No. 8131/2017 that includes the National Oral Health Policy (also known as Smiling Brazil) in the Organic Health Law, oral health actions at the federal level gain the status of State public policy. Differing, then, from government policies, which are linked to the administration that occupies the executive. As a State policy, it emphasizes social justice, democracy and citizenship – conceived as faces of a commitment that is, in essence, ethical and political and find their full realization in the education of a country, in its primary function of leading peoples to social and cultural emancipation (OGIBA SMM, 2016).

With this, oral health effectively became a right of all Brazilians guaranteed by law. The act recognizes the importance of access to dental care in the SUS and reinforces the commitment of the Federal Government to the integral care of Brazilians. The Ministry of Health adopted, as a first measure, to strengthen Brasil Sorridente, the expansion of care with the accreditation of 3,685 new oral health teams and 630 new services and care units, with an investment in these new qualifications that exceed R$ 130 million in 2023 (Brasil, 2023).

The Smiling Brazil Program was originally created in 2003 and received significant incentives in the first ten years of its existence, being weakened in subsequent years. Currently, the PNSB now as a State policy, has norms and guidelines aimed at the expansion and qualification of oral health care in primary care, instigating the realization of health promotion and prevention activities allowing better care with users of the Unified Health System (SUS).

The educational/preventive programs that make up Brasil Sorridente can be executed by several light technologies, such as supervised oral hygiene, topical application of fluoride, lectures, posters,

theaters, pamphlets among others, considering education, with playful activities to enhance learning, where it allows the child to explore his imagination and expand his repertoire, therefore promotes changes in attitudes and daily behaviors (Barboza et al., 2016; Pereira et al., 2017).

The main means of action of the Smiling Brazil Program were through the reorganization of Primary Oral Health Care, highlighting the implementation of Oral Health Teams (eSB) in the Family Health Strategy (FHS), the expansion and qualification of specialized care with the implementation of Dental Specialty Centers (DSC) and Regional Dental Prosthesis Laboratories (LRPD) and the possibility of adding fluoride in water supply treatment plants public. In addition to acting in interministerial and interministerial actions, such as those to promote oral health in schools (Brasil, 2016).

With the purpose of further increasing the health of children and young people in Brazil, in 2007 the School Health Program (PSE) was instituted with the objective of allowing the complete development of students and supporting the training process of health and education professionals in a permanent and continuous way. Relating in a profound way health and education, with the insertion of oral health actions in schools, which should promote, prevent and educate with regard to diseases related to oral health (CARNEIRO et al., 2020; BRASIL, 2016).

The School Health Program (PSE) is an intersectoral initiative of the Ministries of Health and Education that aims to contribute to the full development of students in the public school system of basic education, through the articulation between health professionals of Primary Care and education professionals. It was established on December 5, 2007 by Decree No. 6,286, and currently regulated by Interministerial Ordinance No. 1,055 of April 25, 2017. Thus, health and education policies aimed at children, adolescents, young people and adults in Brazilian public basic education unite to promote health and integral education, strengthening actions to confront vulnerabilities, expanding access to health services and contributing to the improvement of the quality of life of Brazilian students.

The PSE is, therefore, a strategy of permanent integration of Health and Education for the development of citizenship and qualification of Brazilian public policies that aims to develop the integral training of students in the public basic education network through prevention, promotion and health care actions (Brasil, 2021).

It is understood that the school environment is the most favorable for the accomplishment of these activities, because it is the place where the educational activities related to the construction of knowledge take place, encourage autonomy and the practice of rights and duties, facilitating the adoption of preventive activities, such as healthy eating habits and oral hygiene (Pereira et al., 2017; Oliveira et al., 2018).

In this context, the themes related to oral health should be addressed with a focus on health promotion and attention and disease prevention, and leading the student to the development of

citizenship and human rights, through a learning of self-care, care for others and the environment (Brasil, 2021).

2.3 ORAL HEALTH CONDITION OF SCHOOLCHILDREN IN BRAZIL

At the turn of the 90s to the 2000s, Brazil had a high rate of edentulism (absence of teeth) in the adult population, about 72%, and due to the serious oral health condition in 12-year-old schoolchildren related to dental caries, with a high rate of decayed, missing and filled teeth (DMFT) of 6.7 (Oliveira et al., 2018; Chaves et al., 2017).

It is noteworthy that the DMFT index was formulated by Klein and Palmer in 1937 and is used by the World Health Organization (WHO) to assess the prevalence of dental caries in several countries. The age of 12 years is an international reference for the calculation of the index because it is the age at which the permanent dentition is practically complete. The WHO recommends as ideal a mean DMFT value lower than 1.1, at 12 years, which corresponds to a very low prevalence of caries (the acronym DMF originates from the words "decayed", "lost" and "filled", and the D indicates that the unit of measurement is the tooth) (Agnelli, 2015).To improve these problems, the Smiling Brazil Program (PBS) was launched.

The success of such measures has been proven through some studies such as the survey of the DMFT index, which went from 6.7 in 2000 to 2.1 in 2010, see figure 04 (Oliveira et al., 2018; Chaves et al., 2017). From this occurred the decrease in the rates of oral diseases and the increase in the number of adults with teeth in the country, being recognized that the inclusion of oral health in primary care and the maintenance of fluoridation of public water supply were important strategies in reducing caries, but many people still do not have access to such benefits in the country (Chaves et al., 2017; Kings, 2018).

For this, it is necessary that the practices of evaluation of oral health conditions are associated with a broad knowledge of the common territory between school and health unit so that they are effective in the production of integral health and not only in oral health (Brasil, 2016).

A good oral health survey aims to recognize what are the risk factors that students may be susceptible to in their daily lives, whether in the school environment or outside it, such as food, especially about sugar consumption, quality of life in the community, conditions of hygiene habits, among others, to thus execute a plan of strategies to combat both individual and collective, through a multisectoral work with the presence of education and health professionals (Brasil, 2021).

In order to obtain a better view of the health condition of schoolchildren in Brazil, the development of the National Survey of Health in Schools (PeNSE) was carried out, which takes place every 3 years since 2009, and identifies the risk and health protection factors of students from public and private schools in the country, the results of this research can be used for the elaboration of

National Oral Health Policies (PNSB) for the prevention of health problems of students (Jordão et al., 2018; Nery et al., 2019).

PeNSE is a survey conducted by the Brazilian Institute of Geography and Statistics (IBGE), affiliated with the Ministry of Health (MS) and supported by the Ministry of Education (MEC) (Jordão et al., 2018).With the data from PeNSE, the School Environment Health Promotion Score (EPSAE) was created, with the objective of identifying the school environments with the best health promotion conditions, to consider which characteristics of schools are strongly linked to oral health promotion, providing the planning and evaluation of characteristic actions (Jordão et al., 2017; Horta et al., 2017).

It can be observed, in the PeNSE data, a socioeconomic inequality related to human development related to school environments, and it is recommended that there be an expansion of the PNSB in the country, with the objective of improving school environments, contributing in a general way to the promotion of oral health, with strategic institutional attitudes that judge the socioeconomic diversities of the regions, reducing the inequalities found (Brazil, 2023).

According to Quadros (2019) socioeconomic conditions have an influence on health and school performance, and it is observed that students who have impaired oral and general health have a greater predisposition to have a worse school performance compared to students with good health.

The SB Brazil is another way to evaluate the oral health of schoolchildren in Brazil with epidemiological surveys that are carried out by the Ministry of Health every 10 years, but the last records are only from the year 2010, since the 2020 survey is in arrears due to the COVID-19 pandemic, even so, there is a relevant growth in the percentages of caries-free children at the age of 12, going from 31% in 2003 to 44% in 2010, in addition to the growth in the number of children who began to receive dental care with PBS (SB Brasil, 2020).

It is noted that the oral health condition of students in Brazil is in a growing improvement due to the various programs proposed in the PNSB. In the Midwest there was a reduction in the DMFT index in 12-year-old children, which in 2003 was the highest in the country, being 3.16, to 2.14 in the 2010 survey, this number is considered by the World Health Organization (WHO) as a low level of dental caries (Silva et al., 2010).

2.4 WORK INTEGRATIONS BETWEEN HEALTH, SCHOOL AND FAMILY TEAMS

Health promotion strategies are the transforming mechanism in the way health and education professionals and managers organize their programmatic actions, services and define their routines, requiring other indicators that inform about the results of these actions and services (Carneiro et al., 2020).

The school and family have an important participation in the child's own development, because it spends a long period of time daily in this environment, becoming an important place in their learning

in general (Oliveira et al., 2018). Health promotion activities in the school environment contribute to the modification of habits of family members and the community in general, such as the reduction of negative health habits, reduction of school absences, communications about the use of public health services, among others (Pereira et al., 2017; Oliveira et al., 2018).

In relation to oral health, educators are seen as collaborators of dentists in health education actions, by spreading knowledge to students, helping to strengthen oral health themes in order to ensure the acquisition of new life habits (Oliveira et al., 2018).

The implementation of actions of prevention and promotion of oral health in schools has as main objective to reduce the effects of diseases with caries and periodontitis, therefore, to improve the conditions of oral hygiene of the child, the family, and the teachers. Projects in continuing education present important results, although health education is the responsibility of health professionals, the participation of the school community is fundamental (Pereira et al., 2017; Oliveira et al., 2018).

In order for the health actions in the daily life of the students to occur continuously, it is necessary that the entire education team, health, family members and the student himself know what are the objectives that are desired to be achieved and that these are integrated in the planning, development, evaluation and care performed (Rossi and Gonçalves, 2022)

Some teachers may not be able to bring the contents on oral health with propriety in the classroom, making it necessary to incorporate oral health education in the training of these professionals in a continuous and permanent way to keep them updated on issues related to oral health (Moura et al., 2018; Oliveira et al., 2018).

Therefore, when talking about oral health education, it is up to the teacher to articulate the integration between the dentist and the student, by the stronger relationship that exists between him and the students, while dentists have the function of training educators, because they have technical and scientific knowledge on the subject (Oliveira et al., 2018).

With this, it is essential to carry out training with them, these activities can occur through the PSE or by other projects carried out by the health network of the municipalities, university extension projects, among others (Rodrigues et al., 2020).

2.5 ORAL HEALTH EDUCATION ACTIONS IN THE SCHOOL ENVIRONMENT;

Currently, the school is not an environment where only the basic subjects are learned, today diverse information is disseminated about accident prevention, hygiene habits, habits for a healthy life among other pertinent topics, welcoming the student in a complete way (Piantino et al., 2018). Health actions in the school environment consider the student in an integral and multidisciplinary way, taking into account their family, community, social and environmental context (Pereira et al., 2017).

According to Nery et al (2019) health promotion programs at school when they occur continuously and have greater participation of the school community, as well as those that address mental health, healthy eating and physical activities, demonstrate greater responses and positive results.

Health education actions have a fundamental role for the absorption of greater knowledge about oral health, increasing the understanding of the health /disease process, covering the risk factors and means of oral health protection, allowing the change of wrong habits by healthy habits (Pereira et al., 2017; Oliveira et al., 2018).

Oral health promotion activities include health education, supervised brushing and topical fluoride application, only the latter of which is performed exclusively by the oral health professional. The preparation of the school team, the execution of creative activities such as the production of plays and small presentations on the theme, as well as the stimulus to habitual visits to the dentist, depending on the needs of each student, are ideas that constitute the oral health care project at school (Brasil, 2021).

Carrying out health educational activities in the school environment can generate several challenges: how to learn to teach, develop activities appropriate to the school phase and expand their creativity are some of them (Campestrini et al., 2019). Health education actions should be individualized, considering not only the specific aspects of each one, but also the sociocultural environment and interpersonal relationships of students, always advocating the quality of activities (Meneses et al., 2021).

Initially, all health education programs should begin with the evaluation of the health condition of the students, noting that before the evaluation it is important to have the authorization of the responsible person through the signing of a consent form. And from there will be elaborated the activities to be performed in the school environment and also in the therapeutic area for the students who need it (Brasil, 2021).

The form used to perform an activity is directly related to the age group that will participate in it. It was observed that in research on which activities preferred health education with students between four and six years, the theaters, activities with music and the exhibition of cartoons were the ones that stood out the most, already with children from seven to ten years is the predilection was for the realization of theaters, scavenger hunts, lecture and comic book (Campestrini et al., 2019).

The use of games and games, which due to various factors go beyond just "playing", make the student understand in a simple way the knowledge that is being passed, thus having the games currently an enormous educational power (Silva et al., 2021).

Researches conducted with adolescents, it was identified that lectures and conversation circles would be the best way to carry out educational activities. With the most recurrent recollection the

activities of brushing and distribution of oral hygiene cases performed in schools by dental professionals (Pacheco et al., 2018).

The hygiene habits of adolescents were also influenced due to the activities carried out in schools, evidencing that oral health programs at school can contribute, along with the acquisition of knowledge, to the change of habits (Pacheco et al., 2018).

Another strategy used and that obtains remembrance are the health actions in schools with the realization of science fairs and thematic rooms with subjects related to health, among which oral health and personal hygiene can be highlighted.(Barboza et al., 2016).

It is worth mentioning that even with the introduction of the PSE, it is still necessary to encourage actions to be carried out in a more egalitarian way in Brazilian schools, based on the fundamental principles of the SUS (Equity, Integrality and Universality) after all the gain of healthy habits will accompany students throughout their lives (Brasil, 2021).

3 FINAL CONSIDERATIONS

It is possible to analyze that students in Brazil have an oral health condition of increasing improvement due to the programs proposed in the PNSB.

Thus, health and education policies aimed at this public basic education public public are gradually reaching the proposed objective, strengthening actions to confront vulnerabilities, expanding access to health services and providing a better quality of life for students.

The PSE proves to be an important strategy for the permanent integration of Health and Education. This also contemplates the school environment as the most favorable for the integral formation of the student through actions of prevention, promotion and health care, facilitating the adoption of preventive activities by encouraging autonomy and the practice of the rights and duties of the individual.

In this context, for health promotion actions to occur continuously by students, it is necessary that the entire education, health, family and students themselves have security in what they want to achieve as a goal in this sense and that they are integrated in all processes.

It is also verified the fact that some education professionals may not be able to address content on this topic, making it necessary to incorporate oral health education in their training, either continuously or permanently.

Thus, for there to be an effective oral health promotion for students, it is important that the areas are integrated so that one aggregates the other, with teachers as disseminators of information for the stronger relationship they have with students, and health professionals as educators' capacitors, through projects carried out by the health network, extension projects, among others, since they have technical and scientific knowledge on the subject.

REFERENCES

ASAKAWA, LAÍS; FRANZIN, LUCIMARA CHELES DA SILVA. Tratamento Restaurador Atraumático (ART): uma visão contemporânea. Uningá Review, v. 29, n. 1, 2017.

CARNEIRO, Valéria Rabêlo; DE MEDEIROS QUEIROZ, Artur. Educar para uma vida saudável: a inclusão da saúde bucal como forma de prevenção à cárie dentária em uma creche municipal do Rio Grande Do Norte. Brazilian Journal of Development, v. 6, n. 10, p. 74286-74296, 2020.

CARTERI, Marta Todero et al. Fatores associados à experiência de cárie e qualidade de vida relacionada à saúde bucal em escolares. Revista da Faculdade de Odontologia-UPF, v. 24, n. 2, p. 242-249, 2019.

CHAVES, Sônia Cristina Lima et al. Política de Saúde Bucal no Brasil 2003-2014: cenário, propostas, ações e resultados. Ciência & Saúde Coletiva, v. 22, p. 1791-1803, 2017.

DA SILVA, Eline Deise Alves et al. Saúde e Cidadania–Transformando a Escola em Promotora de Saúde da Comunidade. Gep News, v. 2, n. 2, p. 50-55, 2018.

DA SILVA, Francielle Dutra et al. Atuação de uma equipe interdisciplinar promovendo saúde bucal na escola: Um relato de experiência. Brazilian Journal of Health Review, v. 3, n. 1, p. 991-1001, 2020.

DA SILVA, Jefter Haad Ruiz et al. Nuances do saber científico: O uso do lúdico como ferramenta de educação em saúde bucal a crianças escolares. Extensão em Foco, n. 22, 2021.

DE FARIA CAMPESTRINI, Niliana Teixeira et al. Atividades educativas em saúde bucal desenvolvidas por cirurgiões-dentistas com escolares: uma revisão sistematizada da literatura. Revista da ABENO, v. 19, n. 4, p. 46-54, 2019.

DE OLIVEIRA BARBOZA, Cíntia et al. Feira da Saúde-prevenção e promoção da saúde no ambiente escolar. BIS. Boletim do Instituto de Saúde, v. 17, n. supl, p. 5-10, 2016.

DE OLIVEIRA RODRIGUES, Ana Áurea Alécio et al. Capacitação dos professores do ensino infantil para promoção da saúde bucal de pré-escolares. Expressa Extensão, v. 25, n. 3, p. 358-366, 2020.

DE SOUZA MENESES, Paulla Valéria et al. Atividades lúdicas para promoção de saúde bucal em escolares: revisão de literatura. Revista Eletrônica Acervo Saúde, v. 13, n. 2, p. e5726-e5726, 2021.

DE SOUSA PEREIRA, Gethesemane et al. A promoção da saúde bucal no contexto escolar: uma revisão integrativa. Revista Expressão Católica Saúde, v. 2, n. 2, p. 09-16, 2018.

DO BRASIL, Federativa; BRASÍLIA, D. F. Ministério da Saúde. SB Brasil 2010: Pesquisa Nacional de Saúde Bucal: resultados principais, 2012.

DO BRASIL, Federativa; BRASÍLIA, D. F. Ministério da Saúde. Departamento de Atenção Básica. Cadernos temáticos do PSE - Promoção da Saúde Bucal, 2016.

DO BRASIL, Federativa; BRASÍLIA, D. F. Ministério da Saúde. SB Brasil 2020, 2020.

DO BRASIL, Federativa; BRASÍLIA, D. F. Ministério da Saúde. Programa Saúde na Escola (PSE), 2021.

DOS SANTOS FERNANDEZ, Matheus et al. Tratamento restaurador atraumático associado a promoção de saúde bucal em crianças escolares com risco à cárie dentária. Revista de Atenção à Saúde, v. 18, n. 64, 2020.

HORTA, Rogério Lessa et al. Promoção da saúde no ambiente escolar no Brasil. Revista de Saúde Publica, v. 51, 2017.

JORDÃO, Lídia Moraes Ribeiro et al. Comportamentos de risco à saúde geral e bucal em adolescentes no Brasil: distribuição temporal, desigualdades socioeconômicas, padrões de agrupamentos e fatores associados. 2017.

JORDÃO, Lidia Moraes Ribeiro; MALTA, Deborah Carvalho; FREIRE, Maria do Carmo Matias. Simultaneidade de comportamentos de risco à saúde bucal em adolescentes: evidência da Pesquisa Nacional de Saúde do Escolar. Revista Brasileira de Epidemiologia, v. 21, 2018.

MOURA, Amanda Meireles Gomes et al. Conhecimento sobre saúde bucal de professores de escolas públicas em Colombo-PR. Rev Espaço para a Saúde, v. 19, n. 1, p. 57-64, 2018.

NERY, Newillames Gonçalves; JORDÃO, Lidia Moraes Ribeiro; FREIRE, Maria do Carmo Matias. School environment and oral health promotion: the National Survey of School Health (PeNSE). Revista de saude publica, v. 53, 2019.

OLIVEIRA, Erick Ely Gomes de et al. Oral health assessment in school program health: who and how?. RGO-Revista Gaúcha de Odontologia, v. 66, p. 154-159, 2018.

OLIVEIRA, Erika Lira et al. A importância do nível de conhecimento dos professores de escola pública do ensino fundamental sobre saúde bucal–revisão de literatura. Revista campo do saber, v. 4, n. 5, 2019.

PACHECO FILHO, Antonio Carlos et al. Educação em saúde bucal no âmbito escolar: opiniões e vivências de adolescentes. In: Anais do Congresso Capixaba de Medicina de Família e Comunidade. 2017. p. 18-18.

PIANTINO, Camila Belfort et al. Propostas de ações educativas no ambiente escolar como prática de promoção da saúde. Ciência et praxis, v. 11, n. 21, p. 107-110, 2018.

QUADROS, Larissa Neves et al. Condições de saúde bucal e sua relação com desempenho e absenteísmo escolar de crianças e adolescentes: uma revisão sistemática. 2019.

REIS, Ademar Arthur Chioro dos; MALTA, Deborah Carvalho; FURTADO, Lumena Almeida Castro. Desafios para as políticas públicas voltadas à adolescência e juventude a partir da Pesquisa Nacional de Saúde do Escolar (PeNSE). Ciência & Saúde Coletiva, v. 23, p. 2879-2890, 2018.

SILVA, Hellen Carla Alves da et al. Cárie dentária e fatores associados aos 12 anos na Região Centro-Oeste do Brasil em 2010: um estudo transversal. Ciência & Saúde Coletiva, v. 25, p. 3981-3988, 2020.

ROSSI, Rebeca; GONÇALVES, Katiéli Fagundes. A importância das ações em saúde bucal no âmbito escolar. Revista Fluminense de Odontologia, v. 1, n. 57, p. 134-148, 2022.

Oral health in home care within the scope of the family health strategy: A look at public policy

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ABSTRACT
Introduction: With the action initiated from the institutionalization of the Declaration of Alma Ata (1978), Primary Health Care (PHC) seeks to achieve the objective of offering universal primary care necessary for the community. In this service, there is the Family Health Strategy (FHS), in which the monitoring of the health territory is carried out, with actions and monitoring of the population by a team. Among the professionals who should compose the FHS team, there are the dentist and the auxiliary or technician in oral health, which, in addition to allowing the expansion of the population's access to services, promote intervention in the determinants of health and the improvement of existing oral health-disease problems. It is noteworthy that the absence or ineffectiveness of oral health care can affect the general well-being of users, resulting in infections in the oral cavity, which, in turn, can result in or aggravate other health problems. Therefore, there is a need to look at those patients who, due to their health conditions, do not meet the conditions to use the dental service in the Basic Health Unit itself, thus requiring home oral health care. Thus, the present work proposes a discussion about the importance of public policies aimed at home care in oral health, more particularly, to describe and analyze the lack of actions of this nature aimed at this population. Objective: To discuss the implementation of oral health in home care, within the scope of the Family Health Strategy. Methodology: This study is a reflective theoretical essay based on the theme of Primary Health Care, its theoretical foundation from the national and international scientific literature and the critical analysis of the authors. Thus, the reflection on the theme and its explanations will be the guiding axis on the subject. As there was no interaction of direct/applied research, the need to submit the study to ethical procedures was excluded. Conclusion: This research aims to gather subsidies to reevaluate the planning of oral health actions and services aimed at the public discussed here and the possible obstacles to the provision of this care, indispensable for the promotion of general health and well-being.

Keywords: Oral health, Home visit, Family Health Strategy.

1 INTRODUCTION

1.1 HEALTH REFORM AND ORIGIN OF THE UNIFIED HEALTH SYSTEM

In Brazil, the concept of health rights began to gain strength from the social movement that culminated in the Sanitary Reform at the end of the 70s, in which manifestations of intellectual and civil groups organized themselves demanding access to health services. This movement, in turn, made

possible a restructuring in the way of thinking about the direct management of services, which was exercised at the time through the National Institute of Medical Assistance and Social Security (INAMPS) (PAIVA; TEIXEIRA, 2014).

From these movements, in 1986, as a result of the convocation effected in 1985 by the Presidency of the Republic, the 8th National Health Conference (CNS) was held, and in this, groups and assemblies fostered and deliberated the most important agendas arising from the sanitary movement that later culminated in the institution of a single system, such as: the demand for the expansion of coverage to all individuals; the need to strengthen the public health sector; and, the urgent and indispensable integration of social security medicine into public health (PAIVA; TEIXEIRA, 2014).

During the 8th National Health Conference there was the massive approval of the guidelines from the Sanitary Reform movement with great popular participation throughout the country, and as a consequence, the creation of the Unified Health System (SUS) through the approval of Organic Law No. 8,080 of 1990, guided by the principles of universality, equity and integrality, which must be guaranteed to all its users, since the right to health is one of those provided for in the text of the Brazilian Federal Constitution, as provided for in Article 196, which thus establishes: "health is the right of all and the duty of the State, guaranteed through social and economic policies aimed at reducing the risk of disease and other diseases and universal and equal access to actions and services for its promotion, protection and recovery" (BRASIL, 1990; 1998).

In the context of this health system, proclaimed by Law No. 8,080/1990, the main way for users to access the services offered should be Primary Health Care (PHC), which should have capillarity to meet the most common health problems and solve a significant part of the health issues of users of this public health system (GIOVANELLA; MENDONÇA, 2012).

1.2 PRIMARY HEALTH CARE AND ORAL HEALTH CARE

The conception of PHC occurred from the Declaration of Alma Ata (1978), in which it was established that the provision of primary care should be available close to the places where people live and work, that is, to the universal reach of individuals and families of a given community (ALMEIDA *et al.,* 2018).

According to the prerogatives of the Ministry of Health (MH), the gateway of users to the services offered by SUS is Primary Care (PC), defined in Article 2 of Ordinance No. 2,436 of September 21, 2017, which approved the National Policy of Primary Care (PNAB) as

> [...] a set of individual, family and collective health actions that involve promotion, prevention, protection, diagnosis, treatment, rehabilitation, harm reduction, palliative care and health surveillance, developed through integrated care practices and qualified management, carried

> out with a multidisciplinary team and directed to the population in a defined territory, over which the teams assume sanitary responsibility (BRASIL, 2017).

It is through the Family Health Strategy (FHS) that the monitoring of the health territory is made, with actions and monitoring of the population by the PC Team, which has as an integral part the dentist and the auxiliary or technician in oral health (BRASIL, 2017).

The consolidation of dentistry in the FHS came through Ordinance No. 1,444, published by the Ministry of Health on December 28, 2000, which established financial incentives with the objective of reorganizing oral health care in PHC (KUHNEN; BURATTO; Smith, 2013).

In order to reorganize the oral health care model through the FHS, in January 2004, the Federal Government instituted the National Oral Health Policy (PNSB), entitled as the Smiling Brazil Program. In the prerogative of this policy, the Oral Health Teams should act at the primary level of care, assuring SUS users the actions of promotion, prevention and recovery of oral health, starting from the premise of the indispensable relevance of oral health for the general health and promotion of the quality of life of individuals (BRASIL, 2018).

As new approaches, concepts, perspectives and modes of execution were being promoted, in the context of the SUS, dentistry advanced in a prerogative improvements in the oral health conditions of users of this public health system (BRASIL, 2006). These actions, in addition to expanding the population's access to services, promoted intervention in the determinants of health and the improvement of existing oral health-disease problems, always guided by the principles and guidelines of the SUS (ANDRADE; FERREIRA, 2006).

Among the aspects that were determinant for the structuring of a new model of oral health care, we highlight the financial incentives applied by the Ministry of Health; the improvement of management that includes the indispensable need to promote oral health with a view to promoting the general health of SUS users; and the possibility of restructuring oral health actions developed through promotion practices, prevention and recovery of health (MATTOS *et al.,* 2014).

Also in the context of advances related to the field of oral health, it is noteworthy that, on May 8, 2023, Law No. 14,572 was sanctioned, which established the PNSB in the context of the SUS, amending Law No. 8,080/1990, in order to make the insertion of oral health in the scope of action of the SUS. It is important to emphasize this, because, before this one, this policy was based only on ordinances published by the Ministry of Health (BRASIL, 2023a).

In Article 2 of Law No. 8,080/1190, the guidelines of the PNSB are set out:

> I - stimulate and promote the practice of participatory management, ensuring the performance of popular representations and public or social control, in all spheres of government, in the formulation and discussion of oral health strategies; II - to ensure that any and all actions are governed by the universal principles of health ethics; III - enable universal, equitable and continuous access to quality oral health services, giving resolution to all manifest, spontaneous or programmed demand, and enable the obtaining and allocation of resources intended for the

> elimination of repressed demand in the area; IV - develop actions considering the principle of integrality in health, which should include both the actions of the intersectoral scope and the dimensions of the individual, the health system and health care, ensuring the reception and organization of the health service in a user-centered way, performed by a multidisciplinary team in the acts of receiving, listening, guide, attend, forward and accompany; V - to establish bond relations between the oral health team and the population and to ensure that the actions developed are directed to the different lines of health care; VI - develop a policy of permanent education in health for oral health workers, with the objective of implementing projects of change in training at the technical, undergraduate and graduate levels, in order to meet the needs of the population and the principles of the SUS; VII - carry out systematic evaluation and monitoring of the results achieved, as part of the planning and programming process; VIII - organize and maintain epidemiological and sanitary surveillance actions in oral health, articulated with the health surveillance system, incorporating continuous practices of evaluation and monitoring of damages, risks and determinants of the health-disease process, with intersectoral action and actions on the territory; IX - conduct, periodically, national oral health surveys, notably epidemiological population surveys, enabling the country to have updated data on this area and to promote the development of science and technology in this field; X - implement and maintain sanitary surveillance actions of fluoridation of public water supply, mandatory under the terms of Law No. 6,050, of May 24, 1974, as well as complementary actions in the places where they are necessary, and ensure the public power control over these actions (BRAZIL, 2023).

The PNSB proposes the adoption of programmatic, comprehensive and intersectoral practices, which should be elaborated by "lines of care", that is, encompassing all the life cycles of the individual. These, in turn, should contribute to the population's access to promotion, recovery and rehabilitation actions; health education actions; water fluoridation; topical fluoride application; and supervised oral hygiene (BRASIL, 2004).

To promote patient autonomy, one of the actions developed by the PNSB is to adopt the Supervised Oral Hygiene (HBS) activity as a successful strategy, encouraging self-care. Supervised oral hygiene comes as a core in the development of actions, seeking the understanding that oral hygiene is an indispensable element of body hygiene of individuals. To perform it properly, however, the patient must be taught. Still within the scope of the actions that should be developed in the context of the PNSB, the topical application of fluoride was also adopted in order to prevent and control caries, using fluoridated substances (BRASIL, 2004).

Regarding the need to adopt intersectoral public policies that can ensure the implementation of fluoridation. The PNSB starts from the premise that access to treated and fluoridated water constitutes a conditioning factor for the promotion of the population's health. In the context of health education actions, it seeks to enhance the provision of knowledge about the health-disease process, encompassing risk and protective factors. It is sought through this, to enable the patient to change habits, without disregarding their autonomy (BRASIL, 2004).

In relation to health promotion and protection actions, these are essentially educational – preventive, which can be developed both individually and/or collectively, and should be fostered by the SUS, and can be articulated with community associations, government institutions, for example,

in order to minimize risk factors. Here are also grouped the actions of identification and dissemination of information about the aspects of health protection (BRASIL, 2004).

Regarding dental health recovery actions, these include those inserted in the diagnostic field and, therefore, extend to the practices identified as necessary to treat the identified diseases. As for the first, this should be carried out as quickly as possible, as well as treatment, in order to contain the evolution of the disease and stop the appearance of possible disabilities and losses arising from the disease. As for the actions related to the latter, these should be conservative (those that excel in the maintenance of dental elements), opposing the mutilating logic (BRASIL, 2004).

Finally, rehabilitation actions are those carried out with the purpose of partially or totally recovering the capacities lost as a result of the disease. It also aims to reintegrate the patient in his social context and make professional (BRASIL, 2004).

Thus, it should be noted that the institution of the PNSB provided significant advances in the oral health model hitherto predominant in PHC, among which we can mention those pertinent to access, welcoming, bonding, and to a lesser extent, advances concerning health promotion, interdisciplinary approach and territorialization (**SCHERER *et al*., 2018).**

However, some paradoxes are still present, in which the biomedical model has still been translated into the scope of oral health actions, as opposed to the model proclaimed in the PNSB guidelines, such as: the predominance of the most mutilating model, to the detriment of the restorative; majority focus on individual actions and not on collective ones, materialized by the greater focus on clinical consultations, with prejudice to the actions directed to the territory, family and the community in an integrated way with the PHC; incipient articulation between the oral health teams and the FHS teams; lack of a participatory management, horizontalized and articulated with the real demands of the territory and not with the profile of the professionals who make up the oral health team; inadequate infrastructure; absence of materials and inputs indispensable for the execution of the activities; and, overload of professionals (**SCHERER *et al*., 2018; OLIVEIRA *et al.,* 2022; PINHEIRO, VASCONCELOS; GOMES, 2023).**

It is noteworthy that the need to improve the implementation of the PNSB can be attested in the preliminary results of the last National Oral Health Survey (SB Brasil), proposed with the objective of enabling the diagnosis of oral health in the country, and to provide subsidies for the implementation of the actions of the PNSB. Thus, data from this research in progress since 2020, indicate that there is still a significant portion of the Brazilian population in need of dental consultations urgently, and of this, 44.9% are elderly people (in the age group of 65 to 74 years) in need of some

type of immediate treatment due to the presentation of pain or dental infections of oral origin (BRAZIL, 2023b).

Pinheiro, Vasconcelos and Gomes (2023) argue that the current situation of the implementation of the PNSB reveals the urgency of this becomes a State policy, with the objective of consolidating the health care model based on the defense of life and the understanding of the place that social determinants occupy in the health-disease process. There is an urgent need to conceive of access to oral health actions as a right, which must be ensured by a universal, public and quality system for the entire Brazilian population.

That said, the adoption of a political project to combat the lack of funding and the weakening of the SUS becomes indispensable, as well as a redirection of the work processes of the FHS teams, which opposes the provision of fragmented care and that is based on the expanded concept of health and focused primarily on health promotion (PINHEIRO; VALENCIA; GOMES, 2023).

It urges to emphasize that the absence of oral health care can affect the general well-being of users, which may result in infections in the oral cavity, which can bring biological damage, later generating health problems, or aggravating some already existing. Therefore, there is a need to look at those patients who, due to their health conditions, do not meet the conditions to use the dental service in the BHU itself, thus requiring home oral health care. In the provision of care aimed at these, it is necessary that the social conditioning factors that affect their lives be considered, since they put them in a situation of exacerbated vulnerability. Therefore, we defend an ideal of care that opposes the model of health care with a majority focus on the disease, and that interprets the health-disease process as a social product (MORAES; Cohen, 2021).

Thus, the research that will be carried out will aim to answer the following question: in view of the publication of the Guidelines of the National Oral Health Policy (PNSB), what are the elements described in the studies published in the period from 2004 to 2023, which point to the performance of the Oral Health Teams in Home Care within the scope of the Family Health Strategy?

Thus, we start from the hypothesis that, despite being recommended by the PNSB the need to develop oral health actions in the homes of people of FHS users who do not have the conditions to go to the Basic Health Unit (BHU) in Brazil, their development is still incipient, while oral health care aimed at this public, it is still detached from the guidelines of the Ministry of Health.

1.3 ORAL HEALTH IN HOME CARE

Since 1990, Home Care (HC), defined by Ordinance No. 825, of April 25, 2019, as a type of health care that makes up the Health Care Network (RAS), conceptualized as being "[...] a set of actions for the prevention and treatment of diseases, rehabilitation, palliation and health promotion, provided

at home, ensuring continuity of care", has been growing significantly due to the accelerated aging process of the Brazilian population and the increase in Chronic Degenerative Diseases (CDD) (BRASIL, 2019; MARTIN; CYNAMON; COHEN, 2019).

Thus, over the years, changes in health demands, evidenced by various population and age segments, have been observed. Faced with these, the SUS was faced with the need to implement more appropriate actions to meet these different demands. Given the increase in care for the elderly, users with chronic degenerative diseases or with consequences arising from diseases or accidents, and individuals with limitations to access health services, the HC has been shown as a relevant instrument that demonstrates the concern of the SUS with the needs of the various age groups and the Brazilian population (BRASIL, 2020).

The work process of the FHS team focused on domiciled patients is not different from other actions implemented in PHC. That is, this type of care should be directed in the light of the principles of the SUS, adopting the family as the core of care, providing care that is resolutive and longitudinal. With this purpose, it is essential that the teams be organized to, in the territories, offer the appropriate reception of the health demands of this population follow-up that, due to various reasons, demonstrate the need for home care (BRASIL, 2020).

It is worth emphasizing that in the scope of the attributions that are common to all the members of the teams working in PC, there is the accomplishment "[...] home care to people with controlled/compensated health problems with some degree of dependence for activities of daily living and who cannot travel to the Basic Health Unit" (BRASIL, 2017).

In the PNSB, the home visit is presented as an inseparable practice of the daily work of the oral health team working in the UBS. Through this, the identification of risk, and soon, the monitoring and treatment necessary to meet the oral health needs of bedridden patients or with mobility difficulties become possible (BRASIL, 2004).

Even though home visits are recommended by the Ministry of Health as an important work resource of the FHS teams, due to the recognized need to adopt new forms of care, the expansion of this care strategy suffers from some impasses, which make it problematic to change the archaic health care model, to the detriment of a model that is substitutive and, therefore, based on the demands of the territory, which has as its core the family, which dialogues in a perspective opposed to the curative and medicalizing assumptions, and which is based on practices of prevention, promotion and health care. In practice, the predominance of this last model should be remarkable, however, what is perceived is that it is the coexistence of both models in the work process of the FHS teams (CUNHA; SA, 2013).

Regarding the oral health actions that should be developed by the oral health teams of PC and directed to domiciled patients, after the anamnesis process is completed, the evaluation of the demand for oral health treatment should be carried out and if there is a possibility, these should be carried out

at the patient's own home. In this sense, procedures such as prophylaxis, scraping, restorations, adaptations of dental prostheses, and in some cases, even tooth extractions, can be performed (BRASIL, 2020).

In addition to clinical actions, the demand for health education activities directed to patients and their caregivers is noteworthy, in the sense of having guidelines related to oral hygiene (MORAES; CYNAMON; COHEN, 2019).

The research of Silva, Peres and Carcereri (2020) summarizes the main activities that have been developed by the FHS teams, aimed at promoting oral health at home: guidance on healthy lifestyle habits; oral hygiene and diet guidelines; diagnosis of oral cancer, in line with the predictions of the PNSB that suggest home visits as an active search instrument and propitious space for the identification of oral lesions, being in accordance with the guidelines of the PNSB.

Fusco *et al.*, (2023) emphasize that, in addition to the actions of orientation, brushing and identification of lesions in the oral cavity, home visits (which should rely on the oral health service offered by the FHS), are powerful environments to potentiate a greater connection of professionals with the reality of users, and these are of great importance so that they can obtain a comprehensive understanding of the ways of life of these users, their health demands, in a larger perspective of their care.

Despite the importance of AD for the provision of comprehensive care, Procópio *et al., (2019) and* Silva, Peres and Carcereri (2020) point out that the implementation of actions in this perspective still reveals itself as a challenge for public health policy managers. For the first authors, this new prerogative of care is opposed to that linked to the production of traditional care, by requiring the overcoming of health spaces, and revealing itself as a substitute alternative to this model, making it possible to offer care that transcends the entrenched model, notably medicalizing.

For Silva, Peres and Carcereri (2020), the challenge lies in the conflict that emerges from the difficulty of guaranteeing families and users home care and also ensuring the care of the needs of all other families in the territory and account for the activities that are inherent to the daily life of PC.

The challenges that are present for the provision of oral health care by the FHS teams, draw a panorama in which only 50% of the professionals involved in this one, perform oral health practices directed to this population, and point to the fact that, even being defended as indispensable by the Ministry of Health, to ensure universal access, equitable and integral to individuals unable to go to the UBS, the frequency with which these actions are performed is still reduced, as Silva, Peres and Carcereri (2020) point out.

In view of the above considerations, it is noted the urgency of research that proposes to investigate how oral health care has been carried out for domiciled patients, aiming to enable the improvement of this service, so important for the promotion of the general health of SUS users.

REFERENCES

ALMEIDA, F. P; MEDINA, M.G; FAUSTO, M; C. R; GIOVANELLA, L; BOUSQUAT, A; MENDONÇA, M. H. M. Coordenação do Cuidado e Atenção Primária à Saúde no Sistema Único de Saúde. Saúde debate, v. 42, n. 1. p. 244-260, 2018. Disponível em:<https://www.scielo.br/j/sdeb/a/N6BW6RTHVf8dYyPYYJqdGkk/?lang=pt&format=pdf>. Acesso em: 26 mai. de 2023.

ANDRADE, K. L. C; FERREIRA, E. F. Avaliação da inserção da odontologia no Programa Saúde da Família de Pompéu (MG): a satisfação do usuário. Ciênc. Saúde Coletiva, v. 11, n. 1, p.123-130, 2006. Disponível em:<https://www.scielo.br/j/csc/a/fwcCcsGwmfD3GbmnpjgDfvm/?format=pdf&lang=pt>. Acesso em: 20 mai. de 2023.

BRASIL. Constituição da República Federativa do Brasil de 1988. Brasília, DF: Presidente da República, 1998. Disponível em: <https://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm>. Acesso em: 20 mai. 2023.

BRASIL. Lei n. 8.080, de 19 de setembro de 1990. Dispõe sobre as condições para a promoção, proteção e recuperação da Saúde, a organização e o funcionamento dos serviços correspondentes e dá outras providências. Diário Oficial da União, Brasília, DF, 20 set. 1990. Seção 1, p. 18055-18059.

BRASIL. Lei nº 14.572, de 8 de maio de 2023. Institui a Política Nacional de Saúde Bucal no âmbito do Sistema Único de Saúde (SUS) e altera a Lei nº 8.080, de 19 de setembro de 1990, para incluir a saúde bucal no campo de atuação do SUS. DF: Presidente da República, 2023a. Disponível em: <http://www.planalto.gov.br/ccivil_03/_ato2023-2026/2023/lei/L14572.htm#art5>. Acesso em: 27 mai. 2023.

BRASIL. Ministério da Saúde. Portaria nº 2.436, de 21 de setembro de 2017. Aprova a Política Nacional de Atenção Básica, estabelecendo a revisão de diretrizes para a organização da Atenção Básica, no âmbito do Sistema Único de Saúde (SUS). Diário Oficial da União, 2017.

BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. A saúde bucal no Sistema Único de Saúde. Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Atenção Básica. – Brasília: Ministério da Saúde, 2018. 350 p.

BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Coordenação Nacional de Saúde Bucal. Diretrizes da Política Nacional de Saúde Bucal. Brasília: Ministério da Saúde, 2004.

BRASIL. Ministério da Saúde. Secretaria de Atenção Especializada à Saúde. Departamento de Atenção Hospitalar, Domiciliar e de Urgência. Atenção Domiciliar na Atenção Primária à Saúde. Secretaria de Atenção Especializada à Saúde, Departamento de Atenção Hospitalar, Domiciliar e de Urgência – Brasília : Ministério da Saúde; 2020. 98 p.

BRASIL. Ministério da Saúde. Pesquisa Nacional de Saúde Bucal prorroga entrevistas e exames até 30 de junho. Secretaria de Atenção Primária à Saúde (SAPS): 2023. Disponível em: <https://aps.saude.gov.br/noticia/21238>.Acesso em: 20 jun. de 2023.

BRASIL. Constituição da República Federativa do Brasil de 1988. Brasília, DF: Presidência da República: 1998. Disponível em: <https://www.planalto.gov.br/ccivil_03/constituicao/constituicao.htm>. Acesso em: 20 maio. de 2023.

CUNHA, M. S. D; SÁ, M. D. C. A visita domiciliar na estratégia de saúde da família: os desafios de se mover no território. Interface-Comunicação, Saúde, Educação, v. *17, n.4*4, p. 61-73, 2013. Disponível em: < https://www.scielo.br/j/icse/a/YBt5R98dMgwPVDpSTWgXGNJ/?lang=pt#>. Acesso em: 10 jul. de 2023.

FUSCO, L. A; UCHIDA, N. S; HIGASI, M. S; KASAI, M. L. H. I; JÚNIOR, H. L. L; UCHIDA, T. H. Práticas adotadas pelas equipes de saúde bucal na estratégia saúde da família: uma revisão da literatura. Arquivos de Ciências da Saúde da UNIPAR, v. *27, n.* 2, p. 666-683, 2023. Disponível em: <https://ojs.revistasunipar.com.br/index.php/saude/article/view/9374/4566>.Acesso em: 20 jun. de 2023.

GIOVANELLA, Ligia; MENDONÇA, Maria Helena Magalhães. Atenção primária à saúde. In: Giovanella, Ligia et al. (Ed.). *Políticas e sistema de saúde no Brasil* Rio de Janeiro: Fiocruz; Cebes. p.493-546. 2012.

KUHNEN, M; BURATTO; SILVA, M. P. Uso do tratamento restaurador traumático na Estratégia Saúde da Família. Rev. odontol. UNESP, v. 42, n.4, p. 2013. Disponível em: <https://www.scielo.br/j/rounesp/a/Pfc9L7C3Jm4hb5hJwcpjDpd/abstract/? lang=pt>. Acesso em: 24 mai. de 2023.

MATTOS, G. M; FERREIRA, E. F; LEITE, I. C. G; GRECO, R. M. A inclusão da equipe de saúde bucal na Estratégia Saúde da Família: entraves, avanços e desafios. Ciênc. Saúde Coletiva, v. 19, n.2, p,373-372, 2014. Disponível em: < https://www.scielo.br/j/csc/a/XG6xk9fSzpV47wjsrWYf6zN/abstract/?lang=pt>. Acesso em: 08 jun. de 2023.

MORAES, L. B; COHEN, S, C. Um olhar sobre a saúde bucal de pacientes acamados domiciliados cadastrados em unidades da Estratégia Saúde da Família no município de Teresópolis/RJ. Physis: Revista de Saúde Coletiva, v. 31, n. 2, p. 1-19, 2021. Disponível em: < https://www.scielo.br/j/physis/a/tFST7kcdGWk7jHRBXg7ksZm/?format=pdf&lang=pt > Acesso em: 23 jun. de 2023.

OLIVEIRA, M. T. P. D; FARIAS, M. R. D; VASCONCELOS, M. I. O; BRANDÃO, I. R. Os desafios e as potencialidades da saúde bucal na Estratégia Saúde da Família: uma análise dos processos de trabalho. Physis: Revista de Saúde Coletiva, v.*32*, p. 01-18, 2022. Disponível em: < https://www.scielo.br/j/physis/a/BGG7znsRCFRXLvLnctyTrwS/>. Acesso em: 15 jun. de 2023.

PAIVA, C. H. A; TEIXEIRA, L. A. Reforma sanitária e a criação do Sistema Único de Saúde: notas sobre contextos e autores. Hist. Cienc. Saúde - Manguinhos, v. 21, n. 1, p. 15-36, 2014. Disponível em: <http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-59702014000100015&lng=en&nrm=iso>. Acesso em: 18 mai. 2023.

PINHEIRO, E. L; VASCONCELOS, M; GOMES, V. E; MATTOS, F. D. F; ANDRADE, C. P. S; AMARAL, J. H. L. Teorização sobre os limites à inserção da saúde bucal na Estratégia Saúde da Família. Ciência & Saúde Coletiva, v. *28*, n. p.1139-1150, 2023. Disponível em: < https://www.scielo.br/j/csc/a/WMwt6QhKKmrNYHXdqdQFfzd/>. Acesso em: 05 jun. de 2023.

PROCÓPIO, L. C. R; SEIXAS, C. T; AVELLAR, R. S; SILVA, K. L. D; SANTOS, M. L. D. M. D. A Atenção Domiciliar no âmbito do Sistema Único de Saúde: desafios e potencialidades. Saúde em debate, v. 43, n. 121, p. 592-604, 2019. Disponível em: < scielo.br/j/sdeb/a/Yz6YQWK9z67wqgrssVY7LBk/?lang=pt>. Acesso em: 10 jun. de 2023.

SCHERER, C. I; SCHERER, M. D. D. A; CHAVES, S. C. L; MENEZES, E. L. C. D. O trabalho em saúde bucal na Estratégia Saúde da Família: uma difícil integração? Saúde em Debate, v. *42*, p. 233-246, 2018. Disponível em: < scielo.br/j/sdeb/a/VNpzjJxJvP3sDfnMJ8SBjpS/>. Acesso em: 15 jun. de 2023.

SILVA, R. M. D; PERES, A. C. O; CARCERERI, D. L. Atuação da equipe de saúde bucal na atenção domiciliar na Estratégia Saúde da Família: uma revisão integrativa. Ciência & Saúde *Coletiva*, *v. 25*, n.6, p. 2259-2270, 2020. Disponível em:< https://www.scielo.br/j/csc/a/jNdndtCX3d4kDFwJgtTCMfP/?lang=pt>. Acesso em: 30 mai. de 2023.

Chronic pain due to low back pain and public policies focused on the health area

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ABSTRACT
When analyzing one of the most recurrent types of pain, low back pain is one of the most common complaints related to the musculoskeletal system and affects a large part of the population at some point in their lives. In the context of the Unified Health System (SUS), pain is a significant concern. Chronic pain can have a negative effect on individuals' lives, affecting their ability to work, perform daily activities, and enjoy a full life. Thus, this text explores the epidemiological profile of these patients, including information on prevalence, risk factors, associated comorbidities and demographic properties. Chronic low back pain is most common in people between the ages of 30 and 60. It is evident that the incidence and prevalence are higher in females and lower in males. Advanced age, obesity, sedentary lifestyle, smoking, heavy physical labor, and a family history of low back pain are factors that can increase an individual's likelihood of developing this condition. Certain occupations can increase the risk of developing chronic low back pain. Thus, in addition to the direct costs associated with health services, chronic low back pain also generates indirect costs. It is crucial to adopt effective prevention and management strategies to minimize the burden of chronic low back pain for the State, investing in health education programs inside and outside the work environment and promoting the reintegration and adequate professional rehabilitation of affected individuals, bringing benefits both to patients and to the economy in general.

Keywords: Musculoskeletal pain, Chronic pain, Public Policies, Occupational Health.

1 INTRODUCTION

Pain is a response of the nervous system that has the function of alerting the body about possible damage to the body, characterized as an unpleasant sensory experience. Low back pain, or low back pain, has several causes that can be modified according to the biopsychosocial of the individual, having a higher prevalence in industrialized societies. Pain can be differentiated into acute, when it is temporary, or chronic, when it persists for a prolonged time (Corgozinho et al., 2020; Valadares, 2020).

In the Unified Health System (SUS), pain is a concern, especially when it comes to chronic pain, which can bring harm to the professional and social life of the individual who lives with it, and

is also related to mental health problems, recognizing the importance of treating and addressing this theme through the development of strategies and policies focused on the theme (Andrade, 2022).

The SUS considers pain as one of the priorities in the lines of care of the Network of Attention to People with Chronic Diseases, which through articulations between the various levels of health care, aims to accompany the patient with chronic diseases, including low back pain, in a continuous and integrated way. The system recognizes the need to address pain in a multidimensional way, considering the physical, emotional, social and psychological aspects. Thus, the treatment of low back pain in the SUS involves an integral approach, with the participation of different health professionals (Brasil, 2013).

Understanding the epidemiological profile of patients with chronic low back pain is essential to identify risk factors, improve diagnosis, plan preventive interventions and provide more appropriate care to affected individuals. Thus, this review explores the epidemiological profile of these patients, including information on prevalence, risk factors, associated comorbidities, and demographic properties (Martins et al., 2022).

Public policies aimed at chronic low back pain should be developed in a participatory and transparent way, involving health professionals and service users, and it is essential that they have an updated scientific basis (Santos and Jakobsen, 2020).

Pain is an unpleasant sensory and emotional experience associated with an injury or potential tissue injury. It is a response of the nervous system that has the function of alerting the body about possible damage or health problems. Pain can be acute, when it is temporary and usually related to a specific injury, or chronic, when it persists for a prolonged period, often beyond the expected healing time (Corgozinho et al., 2020). Based on the text of Corgozinho et al., (2020, p. 250) "it is directly related to the quality of life and, depending on its severity, can lead those who suffer from it to ask for their own death."

> While suffering is seen as a vast, universal, existential feeling, pain can be described as a physiological process. It can be, however, physical or emotional, related or not to some "real" wound. The word that designates it originates from the Latin *dolor,* usually defined as an unpleasant or painful impression, resulting from some injury or contusion, or from an abnormal state of the organism or part of it (Corgozinho et al., 2020, p. 250).

This sensation is perceived through specialized receptors called nociceptors, which are present throughout the body. These nociceptors are activated in response to harmful stimuli such as intense heat, excessive pressure, irritating or inflammatory chemicals, and tissue lesions. These signals are transmitted to the central nervous system (CNS) through nerve fibers, where they are processed and interpreted as a painful sensation (Aalmeida and Kraychete, 2017). January (2017, p. 15) points out that "its complexity requires an equally complex classification. Therefore, to classify pain you have to take into account the duration, the location and the eventual association with some pathology."

Also titled algia, it can be classified into different types, based on its duration, location and origin. Acute pain is short-lived and usually occurs as a result of a specific injury, such as a bone fracture, a burn, or a cut. According to January (2017, p. 15) acute pain is defined as "pain of recent onset and probable limited duration, with a temporal and/or causal definition". Likewise, Corgozinho et al., (2020, p. 250) point out that "acute pain is one of the main reasons for seeking emergency services, being a valuable symptom in the investigation and definition of the patient's diagnosis."

Thus, the data say that "at least 37% of the Brazilian population, or 60 million people, report feeling pain in a chronic form, one that persists for more than three months, according to a study by the Brazilian Society of Pain Studies (SBED)" (Albuquerque, 2018, s.p). The evaluation is performed based on a combination of patient report, aspects of pain, physical examination, and complementary tests. The physician assesses the intensity of the pain, its location, duration, pattern of occurrence, triggering and relieving factors, in addition to considering the emotional and psychosocial aspects involved (Aguiar et al., 2021).

Pain management may involve different approaches, depending on its cause and characteristics. Analgesics, such as nonsteroidal anti-inflammatory drugs (NSAIDs), opioids, anticonvulsants, and antidepressants, may be prescribed to relieve pain. When analyzing one of the most recurrent types of pain, low back pain, which is a term used to describe a type of pain that occurs in the lumbar region of the spine of the human body, is one of the most common complaints related to the musculoskeletal system and affects a large part of the population at some point in their lives (Bento et al., 2020).

> Low back pain implies a symptom and not a disease. It is classically defined by the location of pain, typically between the margins of the last rib (XII) and the inferior gluteal fold. It is commonly accompanied by pain in one or both lower limbs. Some people with low back pain have associated neurological symptoms (progressive loss of strength and progressive loss of sensation) in the lower limbs (Andrade, 2022, p. 25).

Low back pain can be classified into two main types: acute and chronic. Acute low back pain refers to a recent pain, which usually lasts up to six weeks. It is commonly caused by muscle injuries, twists, lifting heavy objects, sudden movements or improper posture. Chronic low back pain is characterized by persistent pain that lasts more than three months. It may be a result of underlying conditions such as herniated discs, osteoarthritis, spinal stenosis, or inflammatory diseases. In the words of Oliveira, Kanas and Wajchenberg (2021, p. 604) "the characteristics of pain, the symptoms presented on physical examination, changes in imaging tests and the duration are criteria used to classify low back pain".

The symptoms of low back pain can vary in intensity and duration. Patients may experience pain in the lower back that can spread to the buttocks, hips, thighs, and even to the legs (Carvalho et al., 2020). The pain may be throbbing, sharp, constant, or intermittent, and may be accompanied by muscle stiffness, limitation of movement, and a feeling of weakness in the legs. In more severe cases,

low back pain can affect quality of life, making daily activities, such as lifting objects, walking, or sitting for long periods, extremely uncomfortable and difficult to perform (Cargnin et al., 2019).

> Low back pain (LBP) or low back pain is defined as a pain between the lower margin of the 12th rib and the lower gluteal line. It causes pain, discomfort, fatigue or muscle stiffness in the lower third of the spine with variable duration and intensity. Its etiology is not well established and about 30 to 40% progress to Chronic Low Back Pain (CLBP), lasting at least three months. Only 10% of low back pain has a specific cause, being in most cases classified as nonspecific, in which there is an imbalance between the effort required in the activity and the capacity for its execution (Cargnin et al., 2019, p. 708).

In the context of the Unified Health System (SUS), pain is a significant concern. Chronic pain can have a negative effect on individuals' lives, affecting their ability to work, perform daily activities, and enjoy a full life. What's more, chronic pain can be associated with mental health issues such as anxiety and depression, and requires a comprehensive care approach (Andrade, 2022). The SUS recognizes the importance of addressing pain as a public health problem. Pain treatment is considered a patient's right, and the system seeks to offer services and care to alleviate suffering and improve the quality of life of people affected by pain (Aguiar et al., 2021).

Therefore, the SUS develops strategies and policies to deal with this problem in a comprehensive way. The Federal Constitution establishes comprehensive care, with priority for preventive activities, as one of the guidelines in the field of public health, according to article 198, II, of the Federal Constitution. The National Policy of Integrative and Complementary Practices (PNPIC) of the SUS, established by Ordinance No. 971/2006, recognizes the importance of non-pharmacological approaches in the treatment of pain, including low back pain. This policy incorporates practices such as acupuncture, manual therapies (such as chiropractic and osteopathy), body practices (such as yoga and tai chi chuan), and other complementary therapies aimed at promoting comprehensive care and pain relief (Chueiri et al., 2014)

In the same vein, the system also considers pain as one of the priorities in the lines of care of the Network of Attention to People with Chronic Diseases. This network aims to promote the continuous and integrated follow-up of patients with chronic diseases, including those suffering from chronic pain, such as low back pain. This involves the articulation between different levels of health care, from primary care to specialized care, to offer comprehensive and multidisciplinary care. In the lessons of Silocchi and Junges (2017, p. 600) "NCDs are attributed 80% of consultations in primary care and 60% of hospital admissions. They are currently the biggest cause of disability."

A relevant issue to be considered in public policies aimed at chronic low back pain is the social inclusion of affected individuals, which should be developed in a participatory and transparent way, involving both health professionals and users of the system. Chronic pain can have a significant impact on people's lives, limiting their daily activities and their social participation. Thus, it is important that

psychosocial support actions are developed, such as the promotion of self-care and self-knowledge, as well as the creation of support groups for individuals with chronic low back pain.

The promotion of dialogue and collaboration between the different actors is fundamental for the development of effective and sustainable actions in the fight against chronic low back pain. It is essential that public policies focused on the health area are based on up-to-date scientific evidence, and it is necessary to invest in research that contributes to the knowledge and understanding of chronic low back pain, as well as to the development of more effective prevention and treatment strategies (Santos and Jakobsen, 2020).

It is important to emphasize that the SUS recognizes the need to address pain in a multidimensional way, considering not only the physical aspects, but also the emotional, social and psychological aspects. Thus, the treatment of low back pain in the SUS involves an integral approach, with the participation of different health professionals, such as doctors, physiotherapists, psychologists, among others, working collaboratively to offer effective and personalized care to patients (Brasil, 2006; Brazil, 2013).

With the advancement of science, technology and modern medicine, new approaches to the treatment of low back pain have emerged. In the twentieth century, physical therapy techniques, such as muscle-strengthening exercises, stretching and therapeutic manipulations, were incorporated into treatment plans, as well as the use of analgesic and anti-inflammatory drugs to relieve pain and reduce inflammation became common. According to Araújo, Lusiane and Liberatori (2012, p. 59) "through physiotherapy it is possible to obtain considerable improvements for low back pain [...] it can be verified with the guided exercises (stretching, walking, among others) that there was a decrease in subacute and chronic low back pain".

The introduction of imaging tests, such as radiographs, CT scans and MRIs, allowed a better visualization of the structures of the spine and aided in the diagnosis of underlying conditions that can cause low back pain (Salvetti et al., 2012). Technological advances have also had a significant result in the treatment of low back pain. Likewise, Carvalho and Lima (2019, p. 136) expose that "studies show that auriculotherapy has a significant role in reducing pain, reducing the use of medications and improving the quality of life of patients."

Understanding the epidemiological profile of patients with chronic low back pain is essential to identify risk factors, improve diagnosis, plan preventive interventions and provide more appropriate care to affected individuals. Thus, this text explores the epidemiological profile of these patients, including information on prevalence, risk factors, associated comorbidities and demographic properties. Epidemiological studies have contributed significantly to understanding who is more likely to develop chronic low back pain and what are the patterns of occurrence of this condition (Martins et al., 2022).

According to Vieira and Alcântara (2013) chronic low back pain can affect people of all ages, but it is more common in young and middle-aged adults, people between 30 and 60 years are often the most affected, and the prevalence tends to decrease after 60 years.

In the studies developed by Bento et al., (2019) there was an incidence of low back pain of 39.0% in men and 60.9% in women, of the selected population, already in the researches of o Loureiro, Inumaru and Barreto (2017) prevalence of chronic low back pain in females was 97% in relation to 3% of males.

A study by Cargnin et al., (2019) showed that women are more likely to develop chronic low back pain. This may be related to biomechanical, hormonal, or gender-specific psychosocial factors. In addition, Vaz et al., (2017) point out that the prevalence of low back pain in women is higher. This fact can be explained by psychological and physiological factors, such as lower bone and muscle mass, and by the fact that the musculoskeletal system of women is more exposed to the loads associated with pregnancy, maternity tasks and double working hours.

The prevalence of chronic low back pain varies widely in different studies and populations. It is estimated that about 10% to 30% of the world's population suffer from this condition at some point in their lives. The annual incidence of chronic low back pain is approximately 5%, which indicates a significant repercussion on public health (Bento et al., 2019). The prevalence of age, in the findings of Martins et al., (2022) are from 46 to 60 years (reaching the level of 19.8% of the sample that was constituted of 131 patients). Importantly, chronic low back pain most often affects middle-aged and elderly adults, being less common in children and adolescents (Mundin et al., 2020).

Another profile is people who have had injuries or previous episodes of acute low back pain may be more susceptible to developing chronic low back pain. There are also indices of psychosocial factors, such as high levels of stress, anxiety, depression and job dissatisfaction, can also influence the development of chronic low back pain or aggravate symptoms in patients who already have the condition. Some evidence suggests that chronic low back pain may have a genetic predisposition in some cases, in addition, chronic low back pain is a multifactorial condition, that is, its occurrence may be influenced by a combination of several factors (Trombim, Andrioli and Longer, 2021).

Several risk factors are associated with the development of chronic low back pain. Advanced age, obesity, sedentary lifestyle, smoking, heavy physical labor, and a family history of low back pain are factors that can increase an individual's likelihood of developing this condition. The presence of psychological disorders, such as anxiety and depression, is also associated with a higher risk of developing chronic low back pain (Lima et al., 2022). In the ideas of Oliveira et al., (2020) "aging is an important risk factor for chronic low back pain. As we age, the structures of the spine can undergo wear and tear and degeneration, leading to the emergence of chronic pain in the lower back."

The lack of regular physical activity and the weakening of the core and back muscles contributes to the loss of strength and flexibility, making the lumbar region more susceptible to injury and chronic pain increasing the risk of chronic low back pain (Kipel, 2019). Cumulatively, excess weight places an additional burden on the spine and intervertebral discs, increasing the risk of chronic low back pain. Excess adipose tissue can cause systemic inflammation, which can contribute to pain. In this follow-up, according to Loureiro, Inumaru and Barreto (2017, p. 50) "the bones, muscles and joints are obliged to sustain, causing changes in the biomechanical balance of the spine and, consequently, increases the risk of low back pain in overweight and obese people".

Certain occupations that involve weight lifting, repetitive movements, improper postures, or vibrations can increase the risk of developing chronic low back pain. Construction workers, nurses, truck drivers, and those who perform heavy or repetitive work are more likely to develop this pain. The studies by Cargnin et al., (2019, p. 708) "prevalence of LD of 69.6% among nurses showed that the chances of developing any musculoskeletal pain were significantly higher in those with the perception of working for long periods in inadequate positions."

Regarding comorbidities, several studies have shown associations between chronic low back pain and other health conditions. For example, patients with chronic low back pain have a higher prevalence of sleep disorders such as insomnia and sleep apnea (Martins et al., 2022). Apart from that, the presence of diseases such as osteoporosis, arthritis, herniated disc and musculoskeletal conditions is also reported more frequently in patients with chronic low back pain. In the lessons of Araújo, Lusiane and Liberatori (2012) "pain can be caused by many factors, such as obesity, sedentary lifestyle, incorrect posture, excessive weight lifting, low back trauma, osteoporosis, etc."

Persistent pain in the lower back can notoriously affect daily activities, functional capacity, sleep quality, and emotional well-being (Kipel, 2019). Patients with chronic low back pain often report limitations in professional, recreational and social activities, which can lead to an increase in disability and a considerable economic impact for the State, as will be shown below.

Chronic low back pain results in a significant demand for health services. Costs associated with the diagnosis, treatment, and management of chronic low back pain include medical visits, imaging, medications, physical therapy, occupational therapy, surgical procedures, and other medical interventions. These costs can overwhelm the health system, especially in countries where treatment is subsidized by the state (Magalhães et al., 2019). According to Bento et al., (2020, s.p):

> Of the 291 health conditions surveyed in the 2010 Global Burden of Disease study, low back pain was the biggest contributor to overall disability and ranked sixth in terms of global burden of disease measured by disability-adjusted life years.

Chronic low back pain can lead to absenteeism at work, resulting in missed work days. Moreover, even when individuals are present, pain and physical limitation can reduce their productivity

and efficiency. This can have direct consequences on companies and the economy as a whole, with production losses and impact on financial results (Andrade, 2022). In severe cases of chronic low back pain, individuals may become incapacitated for work and be forced to retire early. This results in additional costs to the state in the form of early retirement benefits and other social security programs.

> Between January 2019 and December 2020, more than 10 million formal workers obtained some kind of benefit granted linked to some pathological condition. The number of benefits granted was greater than the number of benefits denied. Non-specific low back pain, represented here by ICD-10 M54.5, was responsible for 49,491 of these benefits in the 24 months studied (Andrade, 2022, p. 79).

In addition to the direct costs associated with health services, chronic low back pain also generates indirect costs. This includes transportation expenses for medical treatments, additional health care costs related to other conditions that may arise due to prolonged physical inactivity, and impact on caregivers and family members of patients who may need to take time off work to provide care (Magalhães et al., 2019). For those who are unable to return to their previous occupations due to chronic low back pain, it may be necessary to invest in vocational training and rehabilitation to help them reintegrate into the labor market in roles tailored to their physical limitations. This entails additional costs for the state, both in terms of rehabilitation programs and financial support during this transition period (Vieira et al., 2022).

Given these economic and financial implications, it is crucial to adopt effective prevention and management strategies to minimize the burden of chronic low back pain for the State (Magalhães et al., 2019). Investments in awareness programs about proper posture, promotion of physical activity, ergonomics in the workplace, and health education can help reduce the incidence and costs associated with this condition. Policies that promote the reintegration and adequate professional rehabilitation of affected individuals can bring benefits both to patients and to the economy in general (Bento et al., 2020).

Low back pain is highly prevalent in the Brazilian population. It is estimated that up to 80% of people experience at least one episode of low back pain at some point in their lives (Lima et al., 2022). Chronic low back pain is a persistent and recurrent condition in many cases, which generates many affected people. It is one of the main causes of medical consultations and hospital admissions in Brazil. This puts significant pressure on the healthcare system, increasing the demand for medical services, imaging, medications, and specialized treatments such as physical therapy and occupational therapy. The treatment of chronic low back pain requires a multidisciplinary and continuous approach, which can pose challenges for the health system (Marioto, Adame and Teixeira, 2023).

The period of the Industrial Revolution, which occurred from the end of the eighteenth century, brought with it profound socioeconomic transformations and directly influenced the health and well-being of workers. The factories were unhealthy environments, with long working hours, poor hygiene,

overcrowding, inadequate ventilation, and exposure to toxic substances. In fact, there was no safety at work, resulting in frequent accidents and dangerous conditions, affecting the health of workers in a harmful way. (Porto and Martins, 2019). Strong (2002, p. 08) points out that:

> The futuristic dream of the twentieth century, decreeing the end of drudgery and unsatisfactory work, in which people would have more and more time for leisure and pleasurable activities, seems to be today a distant and unattainable utopia.

The mental health of workers was affected by the inhumane working conditions. Repetitive work, lack of autonomy, and the oppressive environment of the factories contributed to the emergence of occupational and mental illnesses, such as anxiety and depression. The exploitation and misery resulting from strenuous working hours and low pay also had harmful results on workers' quality of life (Santos and Jakobsen, 2020).

Currently, people work more and more, either to ensure the maintenance of salary levels, prestige and professional recognition, or to ensure the maintenance of their own work (Santos and Jakobsen, 2020). The new productive processes that emerged, mainly, in the last half of the twentieth century, allied to the use of electronics, mechatronics and information and communication technologies have replaced the human workforce, so that those who remained employed needed to work more hours to maintain their employability (Pinto, Pinto and Amorim, 2021).

It was only over time, through the struggles and demands of the workers and the emergence of the workers' movement, that significant changes occurred in working conditions and in the protection of workers' health. Social and political pressure led to the implementation of labor laws, regulating the working day, establishing safety and hygiene standards, and guaranteeing basic labor rights (Porto and Martins, 2019). According to Porto and Martins (2019, p. 01) "assume the emergence of workers' health as an attempt to rupture and advances in relation to both occupational medicine and occupational health."

Thus, in the current era, new diseases related to physical and psychosocial exhaustion have emerged due to the high level of demand of workers, imposing better results and long working hours. New diseases have become true epidemics, requiring professional efforts to understand them and reduce their effects on the health of workers, on Social Security networks and, especially, on the lives of affected individuals and their families. In the studies developed by Pinto, Pinto and Amorim (2021, p. 45):

> The globalization of the economy and the current strengthening of neoliberal thought bring as a consequence the weakening of the Social State and, consequently, of citizenship, of the Democratic State of Law.

Chronic low back pain is one of the consequences in the health of the worker, the relationship between low back pain and the health of the worker is significant, since this condition can cause

anomalies in health and general well-being, in addition to influencing the ability to perform work tasks which becomes an economic problem to be analyzed. The prevalence of low back pain is high in industrialized countries, estimated at approximately 70%, in the United States, low back pain is a medical and socially expensive problem, costing 1,400 days of work lost per thousand inhabitants per year. In Europe, it is the most common reason for limitation in people under 45 years of age and the second most common reason for medical consultation (Vieira and Alcântara, 2013).

Low back pain can be classified into three spheres: nonspecific low back pain that is not associated with a specific cause, such as an identifiable injury or medical condition. It usually occurs due to muscle, ligament, joint, or postural problems. Symptoms can range from mild to severe and may be aggravated by physical activity, repetitive movements, or improper postures. Treatment usually involves conservative measures such as rest, strengthening exercises, physical therapy, and analgesics (Carvalho et al., 2020).

Root low back pain, also called and known as sciatica, occurs when a nerve root in the lumbar spine becomes compressed or irritated, resulting in pain that radiates to one or both legs. The pain may be accompanied by tingling, numbness, or muscle weakness in the affected area. The most common causes of root low back pain are herniated discs, spinal stenosis, or compression of the sciatic nerve. Treatment may involve analgesics, physical therapy, corticosteroid injections or, in severe cases, surgery (Rocha, 2015).

Finally, specific low back pain refers to low back pain caused by an identifiable medical condition or injury. This can include vertebral fractures, spinal infections, tumors, inflammatory diseases such as ankylosing spondylitis, or other specific conditions. Treatment depends on the underlying cause and may involve a multidisciplinary approach with medications, physical therapy, surgery, or treatment targeted at the specific condition (Martins et al., 2022).

Low back pain in workers is one of the main topics discussed in public health and economic management, as there is a high rate of absenteeism, resulting in lost work days (Andrade, 2022). What's more, even when workers are present, low back pain can affect their ability to perform tasks efficiently, resulting in a decrease in productivity. They assert about some of the main causes of low back pain Vaz et al., (2017, p. 02) that "occupational reasons, lack of work skills, anti-ergonomic postures, discontent with the work environment, exacerbation of hours in the same position, and transfer of loads".

The consequences of occupational low back pain "arise at the moment when the activities developed by the patient in his job become triggers for the onset of pain", and can cause constant discomfort and limitations in daily activities, affecting the quality of life of the worker. This can lead to emotional problems such as anxiety, depression and stress (Pereira and Reis, 2021, p. 184). This problem can result in significant medical expenses, including doctor visits, physical therapy

treatments, medications, and possible surgeries. This increases costs for both the worker and the employer in terms of health insurance coverage and related benefits (Vieira and Alcântara, 2013).

> We can cite as the main occupations with the highest prevalence of occupational low back pain the class of domestic servants, carpenters, car mechanics, janitor, hairdresser, construction workers and nurses, which does not ensure that the other professions are not also included in the high rates of involvement. The precariousness of work has been determinant for the emergence of musculoskeletal complaints and within this context the physical, psychosocial demands and difficulty in planning tasks become the main allies for the illness of these workers (Rocha, 2015, p. 08)

Low back pain can compromise workplace safety. When a worker has low back pain, a reduction in concentration and reaction time may occur, increasing the risk of accidents and occupational injuries. It can lead to a sedentary lifestyle, since physical activity can cause discomfort and additional pain. Lack of proper exercise and movement can have as consequences the weakening of the back muscles and an increased risk of recurrence of low back pain (Paula, et al., 2016). Based on the text of Pereira and Reis (2021, p. 192) "indicates a relationship between the appearance of chronic low back pain and the activities developed at work, given the characteristics of the labor market in developing countries."

It is observed that in Brazil, in the socioeconomic context it is possible to identify a large portion of workers who have Work-Related Musculoskeletal Disorders (WMSD), which according to Soares et al., (2019, p. 416) "represent the main causes of morbidity in workers. These disorders can be understood as a set of work-related signs and symptoms, such as pain, paresthesia, fatigue, and limitation of range of motion."

The prevalence of musculoskeletal symptoms in workers is an important topic in the field of occupational health and ergonomics, and are: the pains, discomforts and problems related to the muscles, bones, tendons, ligaments and joints of the body. Such symptoms can be caused or aggravated by work activities and are often associated with repetitive movements, inadequate postures, intense physical exertion, vibrations and other factors related to the work environment. Vieira and Alcântara (2013, p. 53) "among them, the complaints and chronic pain related to the spine stand out. These pains have deserved to be highlighted by the others, when associated with the working class, for their disabling characteristic."

The occurrence of musculoskeletal symptoms in workers can have a significant impact both on their quality of life and on the productivity of companies. In addition, these symptoms can lead to absences from work, sick leave, and even early retirement (Strong, 2002). Studies by Soares et al., (2019) show that some professions have a higher risk of developing these symptoms than others. Workers who perform repetitive activities are more susceptible to musculoskeletal problems compared to other occupations.

In addition, workplace ergonomics is a key factor in preventing musculoskeletal symptoms. Ergonomics aims to adapt the work to the worker, ensuring that the tasks are carried out with the least possible physical overload. Adjustable furniture, proper tools, regular breaks, and training in correct postures are some of the ergonomic interventions that can help reduce the incidence of musculoskeletal symptoms and low back pain. Other determinants can also influence the prevalence of these symptoms, such as the time of exposure to work, the weekly workload, the type of employment contract and the level of social support in the work environment (Porto and Martins, 2019).

It is essential that employers, workers and health professionals are aware of the importance of identifying and preventing the symptoms of chronic low back pain and musculoskeletal pain in the workplace. Occupational health programs, awareness campaigns, and ergonomic training can be effective in reducing the impact of these problems and promoting a healthier, more productive work environment. In this sense, Lima et al. (2022) demonstrate that the prevalence of musculoskeletal symptoms in workers is a public health challenge that requires attention and integrated actions to promote the health and well-being of workers, improving quality of life and productivity in the work environment.

To mitigate these sequelae, it is important to adopt prevention and health promotion measures in the workplace, such as teaching workers to adopt proper postures and to use ergonomic equipment can help reduce the risk of work-related low back pain. Encouraging regular breaks during work and promoting stretching exercises can help relieve muscle tension and improve blood circulation. The studies of Trombim, Andrioli and Longer (2021, p. 57) conclude that this mode is:

> The best way to intervene with these individuals, in order to minimize the consequences of chronic low back pain on their health status and quality of life and the impact it has on health services.

Implementing workload management policies in order to properly distribute tasks, limit overwork, and support performing heavy tasks can reduce physical overhead and the risk of low back pain. In this sense, one should also encourage a healthy lifestyle, with regular physical activity, balanced diet and stress management, can help strengthen the health of workers and reduce the risk of low back pain (Simas, et al., 2020).

Low back pain, as a common condition of low back pain, may be related to the Sustainable Development Goals (SDGs) established by the United Nations (UN). The SDGs are global goals that aim to promote sustainable development in a number of areas, including health and well-being. Thus, with regard to SDG 3 that aims to ensure a healthy life and promote well-being for all, at all ages, low back pain results negatively in the healthy condition of people's lives and can lead to restrictions on daily activities, affecting physical and emotional well-being. When facing low back pain, it is

necessary to ensure access to adequate health services, promotion of healthy habits and effective treatment to improve the health and well-being of individuals (Bento et al., 2020).

Similarly, SDG 8, which aims to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all, may have low back pain as a problem, as it is one of the main causes of disability and absence from work. The adoption of appropriate coping strategies, such as effective treatment, rehabilitation and prevention of low back pain, can contribute to reducing the economic and social impact, ensuring the productive participation of people in the labor market (Lima et al., 2022).

2 FINAL CONSIDERATIONS

Chronic pain in the lumbar region can have a negative effect on the lives of individuals, affecting the performance of their daily activities, their functional capacity, sleep quality and emotional well-being. It is often related to limitations in professional, recreational and social activities, which can increase disability and lead to an economic impact for the state.

In addition to being one of the possible causes of professional limitation, low back pain can also be caused in the professional scope of the individual, being one of the consequences on the health of the worker.

This shows that the working conditions and health of the professional are significant, since this condition can cause anomalies in health and general well-being, in addition to influencing the ability to perform work tasks, which becomes an economic problem to be analyzed.

Thus, the treatment of low back pain should be strongly reinforced in the SUS, involving an integral approach, with the participation of different health professionals, such as doctors, physiotherapists, psychologists, among others, working collaboratively to offer effective and personalized care to patients.

Implementing work management policies can benefit the population and reduce the risk of low back pain incidence. In addition, encouraging a healthy lifestyle, with regular physical activity, balanced diet and stress management, can help strengthen the health of the citizen.

The prevention and treatment of low back pain can be related to the Sustainable Development Goals established by the UN, due to ensuring a healthy life and promoting well-being, favoring sustained, inclusive and sustainable economic growth, providing full and productive employment, as well as decent work for all.

REFERENCES

AGUIAR, Débora Pinheiro; SOUZA, Cleanis Pereira de Queiroz; BARBOSA, Wania Justina Miranda; SANTOS JÚNIOR, Francisco Fleury Uchoa; OLIVEIRA, Anamaria Siriani de. Prevalência de dor crônica no Brasil: revisão sistemática. BrJP. São Paulo, 2021 jul-set;4(3):257-67. Disponível em: https://www.scielo.br/j/brjp/a/Ycrw5pYxPJnwzmkKyBvjzDC/?lang=pt&format=pdf. Acesso em 22 mai. 2023.

ALBUQUERQUE, Flávia. Dor crônica afeta pelo menos 37% dos brasileiros. Agência Brasil - São Paulo. Disponível em: https://agenciabrasil.ebc.com.br/saude/noticia/2018-09/dor-cronica-afeta-pelo-menos-37-dos-brasileiros#:~:text=Pelo%20menos%2037%25%20da%20popula%C3%A7%C3%A3o,ABC%20e%20uma%20cl%C3%ADnica%20de. Acesso em 22 mai. 2023.

ALMEIDA, Darlan Castro; KRAYCHETE, Durval Campos. Dor lombar – uma abordagem diagnóstica. Rev Dor. São Paulo, 2017 abr-jun;18(2):173-7. Disponível em: https://www.scielo.br/j/rdor/a/9JxZrqLhB7r5y8rKWtXDYXt/?format=pdf&lang=pt. Acesso em 22 mai. 2023.

ANDRADE, Igor Caio Santana de. A previdência social, auxílio-doença e aposentadoria por invalidez concedidas e indeferidas na ocorrência de dor lombar não-específica (CID-10 m54.5) em trabalhadores brasileiros (2019-2020): Uma análise exploratória de dados. Dissertação apresentada ao programa de Pós-Graduação em Tecnologia, ambiente e sociedade da Universidade Federal dos Vales do Jequitinhonha e Mucuri, Teófilo Otoni, 2022. Disponível em: http://acervo.ufvjm.edu.br/jspui/bitstream/1/2971/1/igor_caio_santana_andrade.pdf. Acesso em 22 mai. 2023.

ARAÚJO, Alisson Guimbala dos Santos; OLIVEIRA, Lusiane de; LIBERATORI, Mariela Fioriti. Protocolo fisioterapêutico no tratamento da lombalgia. Cinergis – Vol 13, n. 4, p. 56-63 Out/Dez, 2012. Disponível em: https://online.unisc.br/seer/index.php/cinergis/article/view/3093. Acesso em 22 mai. 2023.

BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Diretrizes para o cuidado das pessoas com doenças crônicas nas redes de atenção à saúde e nas linhas de cuidado prioritárias / Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Atenção Básica. – Brasília: Ministério da Saúde, 2013. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/pnpic.pdf. Acesso em 20 jun. 2023.

BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Política Nacional de Práticas Integrativas e Complementares no SUS - PNPIC-SUS / Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Atenção Básica. - Brasília: Ministério da Saúde, 2006. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/diretrizes%20_cuidado_pessoas%20_doencas_cronicas.pdf. Acesso em 20 jun. 2023.

BENTO, Thiago Paulo Frascareli; GENEBRA, Caio Vitor Dos Santos; MACIEL, Nicoly Machado; CORNÉLIO, Guilherme Porfírio; SIMEÃO, Sandra Fiorelli Almeida Penteado; VITTA, Alberto de. Low back pain and some associated factors: is there any difference between genders? Brazilian Journal of Physical Therapy. Volume 24, Issue 1, January–February 2020, Pages 79-87. Disponível em: https://www.sciencedirect.com/science/article/abs/pii/S1413355518310128?via%3Dihub. Acesso em 22 mai. 2023.

CARGNIN, Zulamar Aguiar; SCHNEIDER, Dulcinéia Ghizoni; VARGAS, Mara Ambrosina de Oliveira; SCHNEIDER, Ione Jayce Ceola. Atividades de trabalho e lombalgia crônica inespecífica em trabalhadores de enfermagem. Acta Paul Enferm. 2019; 32(6):707-13. Disponível em: https://www.scielo.br/j/ape/a/zTp7JyNvcn4cTxM8DqQpvRC/?format=pdf&lang=pt. Acesso em 22 mai. 2023.

CARVALHO, Adriana P Fontana; DUFRESNE, Sébastien S; OLIVEIRA, Márcio Rogerio de; FURLANETTO, Karina Couto; DUBOIS, Maryane; DALLAIRE, Mathieu; NGOMO, Suzy; SILVA, Rubens A da. Effects of lumbar stabilization and muscular stretching on pain, disabilities, postural control and muscle activation in pregnant woman with low back pain. Eur J Phys Rehabil Med. 2020 Jun;56(3):297-306. Disponível em: https://pubmed.ncbi.nlm.nih.gov/32072792/. Acesso em 22 mai. 2023.

CHUEIRI, Patrícia Sampaio; HARZHEIM, Erno; GAUCHE, Heide; VASCONCELOS, Lêda Lúcia Couto de. Pessoas com doenças crônicas, as redes de atenção e a Atenção Primária à Saúde. Divulgação em Saúde para Debate | Rio de Janeiro, n. 52, p. 114-124, OUT 2014. Disponível em: https://www.lume.ufrgs.br/bitstream/handle/10183/142570/000992554.pdf. Acesso em 20 jun. 2023.

CORGOZINHO. Marcelo Moreira; BARBOSA, Larissa Oliveira; ARAÚJO, Isabela Pereira de; ARAÚJO, Gabriela Thomaz Ferreira de. Dor e sofrimento na perspectiva do cuidado centrado no paciente. Rev. bioét. (Impr.). 2020; 28 (2): 249-56. Disponível em: https://www.scielo.br/j/bioet/a/3tJx6369mSFQDc3DXy5F8jM/?format=pdf&lang=pt. Acesso em 22 mai. 2023.

DESCONSI, Marcele Bueno; BARTZ, Patrícia Thurow; FIEGENBAUM, Taís Regina; CANDOTTI, Cláudia Tarragô; VIEIRA, Adriane. Tratamento de pacientes com dor lombar crônica inespecífica por fisioterapeutas: um estudo transversal. Fisioter Pesqui. 2019. Disponível em: https://www.scielo.br/j/fp/a/Fcgw9f4mwyqPDN8bLWKWbcN/?format=pdf&lang=pt. Acesso em 22 mai. 2023.

JANEIRO, Inês Margarida Inácio. Fisiologia da dor. Dissertação defendida em provas públicas. Universidade Lusófona de Humanidades e Tecnologias, Lisboa, 2017. Disponível em: https://recil.ensinolusofona.pt/bitstream/10437/8904/1/Fisiologia%20da%20dor%20-%20Vers%c3%a3o%20Final%20-%202017.pdf. Acesso em 22 mai. 2023.

KIPEL, Anna Geny Batalha. Atenção aos pacientes com dor crônica no Sistema Único de Saúde de Joinville. UNIVILLE, 2019. 266,[7] p.: il. ; 30 cm Tese (Doutorado em Saúde e Meio Ambiente – Universidade da Região de Joinville). Disponível em: https://www.univille.edu.br/account/ppgsma/VirtualDisk.html/downloadDirect/1692873/Tese_Final_Anna_Geny_Batalha_Kipel.pdf. Acesso em 22 mai. 2023.

LIMA, Josiany Ribeiro de; COSTA, Tainara Lorrainy dos Santos; Daniely Dutra; SANTOS, Heverton Oliveira dos; BORGES, Maiza Nogueira; MARTINS, Valquiria Trombini; VALLEJO, Nátalia Malavasi. Lombalgia ocupacional: efeitos do tratamento fisioterapêutico no alívio da dor em funcionários que trabalham sentados. VIII Fórum Rondoniense de Pesquisa, v.8, n.1, 2022ISSN: 2764-345X. Disponível em: https://periodicos.saolucasjiparana.edu.br/foruns/article/view/599/539. Acesso em 22 mai. 2023.

LIZIER, Daniele Tatiane; PEREZ, Marcelo Vaz; SAKATA, Rioko Kimiko. Exercícios para Tratamento de Lombalgia Inespecífica. Rev Bras Anestesiol, 2012. Disponível em: https://www.scielo.br/j/rba/a/xH5Kf3HVkT4brhZD9gsDL4q/?format=pdf&lang=pt. Acesso em 22 mai. 2023.

LOUREIRO, Bárbara de Castro Monteiro; INUMARU, Suely Maria Satoko Moriya; BARRETO, Renata Rezende. Perfil epidemiológico e funcional de pacientes com lombalgia crônica. Revista Movimenta, 2017; 10(1):44-56. Disponível em: https://www.revista.ueg.br/index.php/movimenta/article/view/5530/4140. Acesso em 22 mai. 2023.

MAGALHÃES, Marcelo José da Silva de; SILVA, Samara Aparecida Martins Dias; VIEIRA, Fernando Ericson Almeida; LIMA, Samuel Caires Martins de ; MAURÍCIO, Thais Mendes Colares; VIEIRA, Thamara de Souza; OLIVA, Henrique Nunes Pereira. Social security expenses with patients with back pain by the National Institute of Social Security of Brazil from 2008 to 2014. Revista Eletrônica Acervo Saúde / Electronic Journal Collection Health | ISSN 2178-2091 REAS/EJCH | Vol.11 (5)|e233. Disponível em: https://acervomais.com.br/index.php/saude/article/view/233/179. Acesso em 22 mai. 2023.

MARIOTO, Márcio Moyses Bonetti; ADAME, Wellington Luan; TEIXEIRA, Camilla Maria Prudêncio Pilla. Relação dos métodos de avaliação de prevalência de lombalgia no trabalho. Revista Faculdades do Saber v. 8, n. 16, 2023. Disponível em: https://rfs.emnuvens.com.br/rfs/article/view/203/147. Acesso em 22 mai. 2023.

MARTINS, Ana Claudia Martins e; CORRÊA, Roberta de Oliveira; PINTO, Thaíssa Thayara Machado; MONTEIROM Rogéria Pimentel de Araújo. Terapia Ocupacional e Lombalgia: Perfil epidemiológico dos pacientes atendidos na Unidade de Ensino Assistência em Fisioterapia e Terapia Ocupacional da Universidade do Estado do Pará. Research, Society and Development, v. 11, n. 7, e37011729939, 2022. Disponível em: https://rsdjournal.org/index.php/rsd/article/download/29939/25960/344751. Acesso em 22 mai. 2023.

MUNDIM, Bruno Vinicius Resende; BALDESSAR, Eduarda Lorenzetti; GARCIA, Eduardo Marçal; BUBLITZ, Sandro Artur Veit; CECHINEL, Daniel Luiz; SILVA, Joyce Fernandes da; SOUZA, Isabelle Dieguez Perez de; POZZEBON, Vinícius Dino; GESUALDO, Camila Rafaeli; ANTUNES, Marcos Benatti. Práticas integrativas e complementares realizadas em pacientes com lombalgia em uma Unidade Básica de Saúde na região noroeste do Paraná: relato de experiência. REAS/EJCH | Vol.Sup.n.43| e2470. Disponível em: https://acervomais.com.br/index.php/saude/article/view/2470/1462. Acesso em 22 mai. 2023.

OLIVEIRA, Camila Teixeira de; KANAS, Michel; WAJCHENBERG, Marcelo. Tratamento da lombalgia crônica inespecífica: treinamento resistido com ou sem pesos? Rev Bras Med Esporte – Vol. 27, No 6, 2021. Disponível em: https://www.scielo.br/j/rbme/a/tVB9pmRxpSYD6TFBm7YB4XJ/?format=pdf&lang=pt. Acesso em 22 mai. 2023.

OLIVEIRA, Camila Vasconcelos de Arruda; SOUZA, Damião Ernane de; MAGALHÃES, Adriana Gomes; SILVA, Janaína Paula Costa da; CORREIA, Grasiéla Nascimento. Prevalência e fatores associados a problema crônico de coluna em mulheres em idade fértil. Ciência & Saúde Coletiva, 25(3):1041-1049, 2020. Disponível em: https://www.scielosp.org/pdf/csc/2020.v25n3/1041-1049/pt. Acesso em 22 mai. 2023.

PAULA, Elaine Antonia de; BUSCHINELLIB, José Tarcísio; MAENOC, Maria; COSTA, Roberto Fernandes da. Qualidade de vida de trabalhadores com LER/DORT e lombalgia ocupacional atendidos no Cerest de Guarulhos, São Paulo. Rev Bras Saude Ocup 2016;41:e19 1/11. Disponível em: https://www.scielo.br/j/rbso/a/hDjJpbqPnJqGL93kC8WBFZy/?format=pdf&lang=pt. Acesso em 22 mai. 2023.

PEREIRA, Lorem Stefany da Silva; REIS, Yuri Pereira. Abordagem da lombalgia ocupacional na Atenção Primária. Rev. APS. 2021 jan.-mar.; 24(1): 183-98. Disponível em:

https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1359403. Acesso em 22 mai. 2023. Disponível em: https://www.scielosp.org/pdf/csc/2020.v25n3/1041-1049/pt. Acesso em 22 mai. 2023.

PINTO, Flávia Aguiar Cabral Furtado; PINTO, Carlos Eduardo Furtado; AMORIM, Rosendo Freitas de. O direito fundamental à saúde do trabalhador no contexto da reforma trabalhista. Rev, Dir. & Desenvolv. da UNICATÓLICA; v. 4, n. 2, Jul-Dez; 2021. Disponível em: http://publicacoesacademicas.unicatolicaquixada.edu.br/index.php/red/article/view/4970/pdf4. Acesso em 22 mai. 2023.

PORTO, Marcelo Firpo de Souza; MARTINS, Bruno Sena. Repensando alternativas em Saúde do Trabalhador em uma perspectiva emancipatória. Rev Bras Saude Ocup 2019;44:e16. Disponível em: https://www.scielo.br/j/rbso/a/vCxmBVyCC6ssm4WzPZzt5cR/?format=pdf&lang=pt. Acesso em 22 mai. 2023.

ROCHA, Fernanda Santos. O trabalho da fisioterapia junto aos trabalhadores com lombalgia crônica: desafios nos processos educativos. Dissertação apresentada ao Programa de Pós-Graduação Ensino em Ciências da Saúde nível Mestrado Profissional, da Universidade Federal de São Paulo, UNIFESP, 2015. Disponível em: https://revista.acm.org.br/index.php/arquivos/article/view/605/505. Acesso em 22 mai. 2023.

SALVETTI, Marina de Góes; PIMENTA, Cibele Andrucioli de Mattos; BRAGA, Patrícia Emília; CORRÊA, Claudio Fernandes. Incapacidade relacionada à dor lombar crônica: prevalência e fatores associados. Rev Esc Enferm USP. 2012; 46(Esp):16-23. Disponível em: https://www.scielo.br/j/reeusp/a/Zs9TJHrSy3x5tPGQBhPpxDP/?format=pdf&lang=pt. Acesso em 22 mai. 2023.

SANTOS, Artur Henrique S.; JAKOBSEN, Kjeld A. O trabalho nas atuais transformações da globalização capitalista. organização Dalila Andrade Oliveira, Marcio Pochmann. -- 1. Ed. Disponível em: https://www.researchgate.net/profile/Maria-Bridi/publication/362931111_Teletrabalho_em_tempos_de_pandemia_e_condicoes_objetivas_que_desafiam_a_classe_trabalhadora/links/6307ad8facd814437fd6e115/Teletrabalho-em-tempos-de-pandemia-e-condicoes-objetivas-que-desafiam-a-classe-trabalhadora.pdf#page=9. Acesso em 22 mai. 2023.

SILOCCHI, Cassiane; JUNGES, José Roque. Equipes de atenção primária: dificuldades no cuidado de pessoas com doenças crônicas não transmissíveis. Trab. Educ. Saúde, Rio de Janeiro, v. 15 n. 2, p. 599-615, maio/ago. 2017. Disponível em: https://www.scielo.br/j/tes/a/bXRQZ9mg6GcXb5QxcBLLWCb/?format=pdf&lang=pt. Acesso em 21 jun. 2023.

SIMAS, José Martim Marques; RAMOS, Maria do Carmo Vitório Alves; SOUZA, Felipe Granado de; ALENCAR, Maria do Carmo Baracho de. Perfil de trabalhadores com lombalgia atendidos em um serviço de saúde. Revista Pesquisa Em Fisioterapia, *10*(3), 385–392. 2020. Disponível em: https://www5.bahiana.edu.br/index.php/fisioterapia/article/view/2931. Acesso em 22 mai. 2023.

SOARES, Cleuma Oliveira; PEREIRA, Bianca Furtado; GOMES, Marcella Veronnica Pereira; MARCONDES, Laís Passos; GOMES, Fabiana de Campos; MELO NETO, João Simão de. Fatores de prevenção de distúrbios osteomusculares relacionados ao trabalho: revisão narrativa. Rev Bras Med Trab. 2019;17(3):415-30. Disponível em: https://cdn.publisher.gn1.link/rbmt.org.br/pdf/v17n3a16.pdf. Acesso em 22 mai. 2023.

STRONG, Maria Izabel. Lombalgias crônicas em trabalhadores da saúde: a experiência da Escola de Coluna do HCFMUSP. São Paulo; 2002. [Tese de Doutorado - Faculdade de Saúde Pública da USP].

Disponível em: https://www.teses.usp.br/teses/disponiveis/6/6131/tde-02022021-182406/publico/DR_555_Strong_2002.pdf. Acesso em 22 mai. 2023.

TROMBIM, Pietra de Souza; ANDRIOLI, Ivan Bernardes; LONGER, Willians Cassiano. Caracterização da sintomatologia, incapacidade e potencial de catastrofização de trabalhadores com lombalgia crônica inespecífica. Arq. Catarin. Med. 2021 abr-set; 50(2):50-60. Disponível em: https://revista.acm.org.br/index.php/arquivos/article/view/605/505. Acesso em 22 mai. 2023.

VAZ, Évelin Santos; BRONDANI, Amanda de Souza; BARRETO, Sabrina Cabreira; PAZETTO, Luana Sityá; SACCOL, Michele Forgiarini. Caracterização de pacientes com lombalgia assistidos em um centro de referência em saúde do trabalhador. Anais do 9º SALÃO INTERNACIONAL DE ENSINO, PESQUISA E EXTENSÃO – SIEPE, 2017. Disponível em: https://guri.unipampa.edu.br/uploads/evt/arq_trabalhos/13654/seer_13654.pdf. Acesso em 22 mai. 2023.

VIEIRA, Ana Shirley Maranhão; VIDAL, Diogo Guedes; SOUSA, Hélder Fernando Pedrosa e; DINIS, Maria Alzira Pimenta; SÁ, Katia Nunes. Educação em saúde para indivíduos com dor crônica: ensaio clínico. BrJP. São Paulo, 2022 jan-mar;5(1):39-46. Disponível em: https://www.scielo.br/j/brjp/a/8MWCWt6h9HTrbS9L8ncvmQR/?format=pdf&lang=pt. Acesso em 22 mai. 2023.

VIEIRA, Marcus Vinicius Portilho; ALCÂNTARA, Denise Soares de. Prevalência de dor lombar crônica em trabalhadores de enfermagem: revisão bibliográfica. Revista Amazônia. 2013;1(3):49-55. Disponível em: http://www.ojs.unirg.edu.br/index.php/2/article/view/399/189. Acesso em 22 mai. 2023.

VALADARES, Jessyka Viana et al. Prevalência da lombalgia e sua repercussão anatomofuncional em adultos e idosos: Revisão sistemática. AMAZÔNIA: SCIENCE & HEALTH, v. 8, n. 3, p. 106-117, 2020.

Identifying and addressing challenges in pediatric antibiotic therapy: A review of current practices and recommendations

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ABSTRACT

Introduction: The use of antibiotics in pediatric populations, especially in neonates, represents a significant challenge for health professionals due to the increased vulnerability of neonates to infections and possible consequences if antibiotics are not administered. However, current practices and recommendations for pediatric antibiotic therapy are often inadequate and rely on data extrapolated from adult studies, failing to consider pediatrics-specific factors. Objective: In this review, we examine the challenges related to pediatric antibiotic therapy. We address the use of antibiotics in neonatal intensive care units (NICUs), the risks of negative outcomes resulting from inappropriate

and prolonged use of antibiotics, the lack of scientific basis to support recommendations on the duration of therapy, and particular issues related to the NICU. Methodology: This review examines challenges in pediatric antibiotic therapy through comprehensive research in medical databases. Selected studies, including epidemiology, reviews, and professional opinions, reveal problems such as antibiotic overuse and a lack of solid guidelines for duration of therapy. Limitations in the literature, such as the absence of specific studies and robust guidelines for NICUs, have been identified. Discussion: The article demonstrates that the duration of antibiotic therapy for pediatric conditions is limited and variable, and the exact duration of antibiotic therapy for certain conditions is inaccurate. Results: It is crucial to address current gaps in knowledge by researching clinical parameters that can accurately stratify the severity of CAP and make them more sensitive and specific, as well as educating pediatric medical residents to ensure the safe and effective use of antibiotics. In addition, the existing antibiotic arsenal and the potential danger of long-term antibiotic use in neonates should be taken into account. Issues such as culture-negative LOS in premature infants and empirical use of antibiotics to "exclude" are major contributors to the overall use of antibiotics in neonatal units, and strategies for safe antibiotic restriction are difficult to identify and implement. Conclusion: Future research should focus on developing more accurate and effective diagnostic and therapeutic strategies for pediatric antibiotic therapy, as well as on identifying safe and effective strategies for antibiotic restriction in neonatal units. Overall, the results of this review highlight the need for ongoing research and education to improve pediatric antibiotic therapy practices and address the challenges associated with its use.

Keywords: Pediatric antibiotic therapy, Challenges, Neonatal intensive care.

1 INTRODUCTION

Pediatric antibiotic therapy is an essential component in the treatment of bacterial infections in children. However, despite its importance, this form of therapy presents challenges that healthcare professionals must face to ensure the best outcomes for patients. In this review, we will identify and address the common challenges associated with pediatric antibiotic therapy. We will also explore how healthcare professionals can identify and address these challenges. In addition, we will examine current practices and recommendations for pediatric antibiotic therapy. In doing so, we hope to provide a comprehensive understanding of the challenges associated with pediatric antibiotic therapy and offer recommendations to improve patient outcomes.

2 GOAL

In this review, the focus is on the analysis of the challenges associated with pediatric antibiotic therapy. The challenges mentioned include the use of antibiotics in neonatal intensive care units (NICUs), the risk of adverse outcomes due to prolonged and inappropriate use of antibiotics, the lack of scientific evidence to support recommendations for duration of therapy, and specific NICU-related issues.

3 METHODOLOGY

This literature review was based on a broad and systematic search of the relevant scientific literature, in order to achieve the proposed objectives. Medical databases, such as PubMed, MEDLINE

and Google Scholar, were consulted, using keywords related to "pediatric antibiotic therapy", "challenges", "neonatal intensive care". We selected studies that directly addressed the challenges faced in pediatric antibiotic therapy, including epidemiological studies, systematic reviews, clinical studies, and opinion articles by health professionals.

The results of the selected studies were analyzed and synthesized to identify common challenges in pediatric antibiotic therapy. The main points of discussion were grouped into categories, such as overuse of antibiotics, lack of scientific evidence to guide the duration of therapy, and strategies to address challenges in the NICU environment.

It was recognized that the current literature on pediatric antibiotic therapy has limitations, such as the lack of specific studies on the duration of therapy and the need for more robust guidelines for the use of antibiotics in NICUs.

4 DISCUSSION

4.1 CHALLENGES IN PEDIATRIC ANTIBIOTIC THERAPY

4.1.1 What are the common challenges associated with pediatric antibiotic therapy?

The use of antibiotics in pediatric populations is a major challenge, especially in neonatal intensive care units (NICUs). This is due to the increased vulnerability of neonates to infections, as well as the fear of possible consequences if antibiotics are not administered [1]. Long-term use of antibiotics without evidence of sepsis can lead to adverse outcomes such as increased mortality and morbidities [1], while inappropriate use of antibiotics early in life is associated with increased risk of various medical conditions in childhood [2]. Antibiotic use is highest among children two years and younger, and the duration of therapy is largely based on conventions and expert opinions [2], with little scientific evidence to support many of the recommendations. Studies on the duration of antibiotic therapy often rely on data extrapolated from adult studies and do not take into account pediatrics-specific factors [2]. Issues such as culture-negative LOS in premature infants and empirical use of antibiotics to "exclude" are major contributors to overall antibiotic use in neonatal units [3], and strategies for safe antibiotic restriction are difficult to identify and implement [1]. To improve the use of antibiotics, biomarker decision tools, biomarkers with excellent sensitivity and specificity, better diagnostics and optimization of blood culture volume [1] can be employed. Vaccination against Streptococcus pneumoniae, Haemophilus influenza and measles may also have a substantial impact on the overall use of antibiotics for EOS assessments in premature infants [3]. To address the unique challenges of the NICU environment, there is a need for validated antimicrobial use guidelines, sepsis calculators, and evidence-based strategies and easy-to-use point-of-care guidelines [1]. Audit and feedback schemes have been found to be effective in reducing overall antibiotic use, while applying antimicrobial management strategies to NICU populations can be challenging [1].

4.1.2 How can healthcare professionals identify and address these challenges?

Healthcare professionals should take into account the risks and benefits of administering antibiotics to newborns [1]. In order to properly identify and address these challenges, healthcare professionals need to strive for appropriate education and research. For example, pediatric medical residents are essential in this process as they play a critical role in determining the optimal use of antibiotics [4]. In addition, they are responsible for initiating antibiotic therapy and often alternate between adult and pediatric settings [4]. Educational interventions have been suggested to address the potential misuse of antibiotics [4]. In addition, research is needed to accurately stratify the severity of CAP and develop more sensitive and specific tools that can help determine the duration of antibiotic therapy [3][5]. In addition, a meta-analysis suggests that 5 days of antibiotic therapy is effective for uncomplicated acute otitis media, and short-term therapy is recommended for CAP in healthy children [6]. Current studies on the duration of antibiotic therapy are limited [2]. In addition, the existing antibiotic arsenal should be taken into account to illustrate the required duration of antibiotic therapy [7]. In addition, it has been suggested that antibiotics should be routinely administered in the perioperative period to prevent surgical site infection [8]. Finally, health professionals should be aware of the evolution of CAP epidemiology, diagnostic and therapeutic challenges, and antibiotic prescribing practices [9].

4.1.3 What are the current practices and recommendations for pediatric antibiotic therapy?

Research has shown that the duration of antibiotic therapy therapy for pediatric conditions is limited and variable [6], and the exact duration of antibiotic therapy for certain conditions is inexact [7]. For example, the recommended duration of antibiotic therapy for uncomplicated acute otitis media is 5 days [6], while surgical site infection in pediatric patients requires an indeterminate time of antibiotic use [8]. Neonatal providers also often initiate antibiotic therapy without evidence of sepsis [1][10]. In this sense, it is crucial that health professionals are aware of the evolution of the epidemiology of CAP, along with the diagnostic and therapeutic challenges associated with pediatric CAP [9]. It is also essential to adhere to the standard of care, prescribing antibiotics according to age group and local epidemiology, in doses capable of reaching therapeutic concentrations [5]. In addition, it is important to take into account the existing antibiotic arsenal [7], as well as the potential danger of long-term antibiotic use in neonates [1]. Therefore, it is essential to address current gaps in knowledge by researching clinical parameters that can accurately stratify the severity of CAP and make them more sensitive and specific [3], as well as educating pediatric medical residents to ensure the safe and effective use of antibiotics [4].

5 FINDINGS

The results obtained from this study on "Challenges in pediatric antibiotic therapy" reveal that the use of antibiotics in pediatric populations, especially in neonatal intensive care units (NICUs), represents a complex challenge for health professionals. This challenge is based on the vulnerability of neonates to infections, as well as concerns about the possible consequences if antibiotics are not administered appropriately. In addition, research demonstrates that long-term use of antibiotics in neonates without evidence of sepsis may result in adverse outcomes, such as increased mortality and morbidities. Similarly, inappropriate use of antibiotics early in life is associated with a higher risk of various medical conditions in childhood.

An important aspect that emerges from the results is the gap in the scientific evidence to support recommendations for the duration of antibiotic therapy in pediatric populations. The duration of antibiotic therapy is often based on conventions and expert opinions, and many of these recommendations lack sound scientific foundation. In addition, the lack of pediatrics-specific data in studies on the duration of antibiotic therapy is remarkable, since many studies rely on data extrapolated from adult studies.

The review also highlights specific challenges in neonatal intensive care units, where issues such as the empirical use of antibiotics to "exclude" infections, the difficult identification and implementation of strategies for safe antibiotic restriction, and concern about premature infants with negative culture results contribute to overall antibiotic use.

The results point to the need for more precise and personalized approaches in pediatric antibiotic therapy, as well as the implementation of strategies aimed at reducing the inappropriate use of antibiotics, especially in neonates. Education of healthcare professionals, including pediatric medical residents, is considered an essential approach to addressing antibiotic misuse and improving the safe and effective administration of these medications to children. Future research is essential to fill the gaps in the scientific literature and develop validated guidelines, diagnostic tools, and more sensitive and specific therapeutics to guide pediatric antibiotic therapy.

6 CONCLUSION

Based on the analysis of the results, the clinical implications and possible strategies to face the identified challenges were discussed. Specific recommendations included the use of biomarker-based decision tools, vaccination to reduce antibiotic use, antimicrobial management strategies, and education of healthcare professionals, especially pediatric medical residents.

Finally, the importance of health professionals being aware of the challenges associated with pediatric antibiotic therapy and providing recommendations to improve the administration of antibiotics in children is reiterated.

In conclusion, the results of this study reinforce the complexity of the challenges in pediatric antibiotic therapy and highlight the importance of continuous research, medical education, and the development of targeted strategies to address these challenges and improve the quality of antibiotic treatment in children.

REFERENCES

Ting, J., Shah, P. *[HTML][HTML] Antibiotic stewardship in neonates: challenges and opportunities*. (n.d.) Recuperado August 15, 2023, de www.ncbi.nlm.nih.gov/pmc/articles/PMC7347770/

Good, A., Olans, R. *CE: Pediatric Antibiotic Stewardship*. (n.d.) Recuperado August 15, 2023, de www.ingentaconnect.com

Rodrigues, C. *[HTML][HTML] Challenges of empirical antibiotic therapy for community-acquired pneumonia in children*. (n.d.) Recuperado August 15, 2023, de www.sciencedirect.com/science/article/pii/S0011393X16300947

Branstetter, J., Barker, L. *Challenges of antibiotic stewardship in the pediatric and neonatal intensive care units*. (n.d.) Recuperado August 15, 2023, de meridian.allenpress.com

Folgori, L., Bielicki, J. *Future challenges in pediatric and neonatal sepsis: emerging pathogens and antimicrobial resistance*. (n.d.) Recuperado August 15, 2023, de www.thieme-connect.com

Lieberman, J. *Appropriate antibiotic use and why it is important: the challenges of bacterial resistance*. (n.d.) Recuperado August 15, 2023, de journals.lww.com

Nanayakkara, A., Boucher, H. *Antibiotic resistance in the patient with cancer: Escalating challenges and paths forward*. (n.d.) Recuperado August 15, 2023, de acsjournals.onlinelibrary.wiley.com

Jaworski, R., Kansy, A. *Antibiotic prophylaxis in pediatric cardiac surgery: where are we and where do we go? A systematic review*. (n.d.) Recuperado August 15, 2023, de www.liebertpub.com/doi/abs/10.1089/sur.2018.272

Katz, S., Williams, D. *Pediatric community-acquired pneumonia in the United States: changing epidemiology, diagnostic and therapeutic challenges, and areas for future research*. (n.d.) Recuperado August 15, 2023, de www.id.theclinics.com/article/S0891-5520(17)30107-1/abstract

Mukhopadhyay, S., Sengupta, S. *Challenges and opportunities for antibiotic stewardship among preterm infants*. (n.d.) Recuperado August 15, 2023, de fn.bmj.com

SEVEN
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Analysis of the efficacy of frenotomy in the treatment of difficulty in breastfeeding caused by the lingual frenum

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ABSTRACT

Introduction: The lingual frenum is a mucous membrane that connects the tongue to the oral floor, it is responsible for the free movement of the tongue in the mouth. The altered lingual frenulum can be responsible for several problems for the newborn, including difficulties to perform functions such as sucking and swallowing, as well as impairing the proper grip of the breast during breastfeeding, which can cause pain in the mother and difficulties for the baby such as gaining weight and early weaning. Phrenotomy is a simple surgical procedure that has been employed as a treatment option for lingual frenulum alteration, with the aim of improving the condition and quality of life of the mother and newborn in the context of breastfeeding. Objective: To analyze the efficacy of frenotomy in the treatment of difficulty in breastfeeding caused by the lingual frenum, based on a review of the available medical literature on the subject. Clinical studies, such as literature reviews, case reports and research on this topic will be evaluated, in order to identify the evidence on the efficacy and safety of this procedure, pointing out the improvements identified after surgery. Literature review: It is important to identify changes in the lingual frenulum, as they negatively affect the patient's quality of life. Therefore, it is crucial to carry out an early diagnosis in order to offer the most effective treatment for this problem. For this, it is essential that professionals have adequate knowledge to make an accurate diagnosis and solve the issue. Phrenotomy is an option to be considered due to its simplicity in clinical and surgical practice, in addition to presenting few risks in the postoperative period. Final considerations: Given that the initial phase of breastfeeding is crucial for the health and quality of life of the baby, phreotomy is a safe and effective treatment, which also avoids or decreases the consequences of long-term lingual frenulum alteration. Even though there is still research that reports that it is a temporary improvement, this improvement is quite necessary to prevent early weaning, thus avoiding weight loss and the difficulty that mothers face to maintain breastfeeding.

Keywords: Phrenotomy, Lingual frenulum, Breastfeeding.

1 INTRODUCTION

The alteration in the lingual frenulum, is a congenital anomaly that is called ankyloglossia, popularly known as "stuck tongue", where it can be detected early or not. (Pinto et al, 2019)

This occurs in the process of embryogenesis, where there may be a failure in apoptosis, in which the residual tissue disrupts the formation of the frenulum. (Marcione et al, 2016) (Pinto et al, 2019)

The altered lingual frenulum can cause several problems for the newborn, including difficulties to perform functions such as sucking and swallowing, as well as impairing the proper grip of the breast during breastfeeding, which can cause pain in the mother, difficulties for the baby to gain weight and

early weaning. In addition, it is possible to observe problems in diction and phonetics as the child grows. (Marcione et al, 2016).

The intervention indicated when the change in the lingual frenulum is detected, is the phrenotomy. The lack of intervention can have consequences on the quality of life of the child, due to the difficulty in performing the linguistic functions (Luis et al., 2018)

(Marcione et al, 2016) (Pinto et al, 2019)

Phrenotomy is a simple surgical procedure that involves cutting the lingual frenum, and has been employed as a treatment option to improve the condition and quality of life of the mother and newborn in the context of breastfeeding. However, there are still many controversies about the effectiveness of phrenotomy in these cases. (Son et al, 2022).

The requirement of evaluation of the frenulum of the tongue has been fundamental to identify early the alteration of the lingual frenulum and to enable the necessary intervention to avoid the difficulties arising from this condition.

This study aims to analyze the efficacy of frenotomy in the treatment of difficulty in breastfeeding caused by the lingual frenum, based on a review of the available medical literature on the subject. Clinical studies, such as literature reviews, case reports and research on this topic will be evaluated, in order to identify the evidence on the efficacy and safety of this procedure, pointing out the improvements identified after surgery.

2 LITERATURE REVIEW

2.1 ANATOMY OF THE LINGUAL FRENUM

The lingual frenulum, can vary between normal and altered, where its classification varies by anatomical aspects, they are short, when the length is less than the standard. Anteriorized, when it is near the apex of the tongue. Short and anterior, when it presents the two characteristics presented above. (Marcione et al, 2016) (Pinto et al, 2019)

2.2 INDICATIONS FOR FRENOTOMY

Early detection of lingual frenulum alteration is important to perform the intervention. The treatment reviewed has been the phrenotomy, because it is a simple, effective and safe surgical procedure, where it is not common to have complications and there are many benefits to the child. (Son et al.)

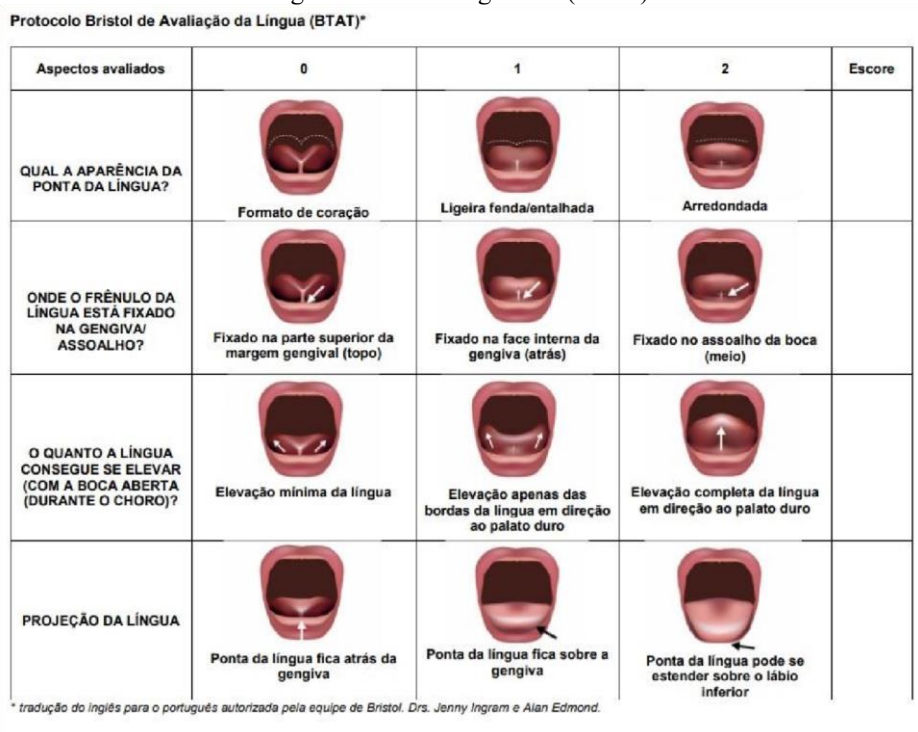
The lack of treatment can cause greater consequences, such as difficulty in breastfeeding, difficulty in speaking, difficulty in performing the functions of the language. (Marcione et al, 2016)

To better indicate the surgical procedure in newborns, there is a neonatal examination that occurs in the maternity, screening of ankyloglossia, popularly known as tongue forehead, this

examination consists of the evaluation of the lingual frenulum before possible difficulties in breastfeeding and other problems related to lingual movement, depending on the result of the examination, it is indicated that the patient make a detailed evaluation with a specialist, to check if there is a need for surgical intervention.

There are some known tests, however the one indicated by the Ministry of Health is the Bristol test (BTAT) which is determined by a score and the lower the change is more severe.

Figure 1 Bristol tongue test (BTAT)



Protocolo Bristol de Avaliação da Língua (BTAT)*

Aspectos avaliados	0	1	2	Escore
QUAL A APARÊNCIA DA PONTA DA LÍNGUA?	Formato de coração	Ligeira fenda/entalhada	Arredondada	
ONDE O FRÊNULO DA LÍNGUA ESTÁ FIXADO NA GENGIVA/ ASSOALHO?	Fixado na parte superior da margem gengival (topo)	Fixado na face interna da gengiva (atrás)	Fixado no assoalho da boca (meio)	
O QUANTO A LÍNGUA CONSEGUE SE ELEVAR (COM A BOCA ABERTA (DURANTE O CHORO)?	Elevação mínima da língua	Elevação apenas das bordas da língua em direção ao palato duro	Elevação completa da língua em direção ao palato duro	
PROJEÇÃO DA LÍNGUA	Ponta da língua fica atrás da gengiva	Ponta da língua fica sobre a gengiva	Ponta da língua pode se estender sobre o lábio inferior	

** tradução do inglês para o português autorizada pela equipe de Bristol. Drs. Jenny Ingram e Alan Edmond.*

2.3 EFFICACY OF PHRENOTOMY IN RELATION TO BREASTFEEDING

The World Health Organization (WHO), recommends that breastfeeding of the newborn is at least until 6 months, as it contributes to the healthy growth of the child and prevents risks of diseases typical of childhood. (Lima and Dutra) Ankyloglossia limits lingual functions, such as sucking and swallowing, which are directly related to breastfeeding, also interfering with breast gripping, and may cause pain in the mother during breastfeeding. (Lima and Dutra) This limitation can cause the child to stop breastfeeding early, which subjects him to risks. For the treatment of ankyloglossia, responsible for this limitation, phrenotomy is recommended, a simple surgical procedure that is considered safe and effective, where it should be done in the first months of life. (Lima and Dutra)

It was reported by the mothers of children with ankyloglossia, who after phrenotomy, perceived better motor coordination in the acts of sucking, swallowing, breathing and improvement in the grip of the chest, resulting in the reduction of pain. (Lima and Dutra)

2.4 EFFICACY OF PHRENOTOMY IN RELATION TO SPEECH AND OROFACIAL DEVELOPMENT

Speech depends on the mobility of the phonoarticulatory organs, such as the tongue, mouth, cheek, teeth and jaw. In order for it to be produced properly, it is necessary to balance these organs. (CAMARGO, 2004)

The change in the lingual frenulum, due to the limitation in the movements of the tongue, affects the phonetics. Thus, phonetics is one of the symptoms for the diagnosis of ankyloglossia. (Canevasssi et al, 2019)

To improve the quality of life of patients with this diagnosis, it is necessary for the patient to be consulted by a speech therapist to perform a comparison between the preoperative and postoperative periods.

The evidence of improvement between the preoperative and postoperative periods is evident especially when related to phonetics. After research, it was reported that patients who had been previously examined, after 30 days postoperatively, presented modified tongue tip shape, lip closure as well as improved movements. (Neto et al, 2014)

2.5 COMPLICATIONS AND RISKS ASSOCIATED WITH PHRENOTOMY

Phrenotomy is considered a low-risk surgical procedure, in which, its adverse effects are, light bleeding, ulcer formation, pain, infection, inflammation, and scar retraction. (Procopio et al, 2017)

Bleeding usually occurs mildly and can be controlled by means of pressure. However, it can happen in a more intense way, requiring suture or cauterization to control this bleeding. An intercurrence due to bleeding can be the formation of a clot, where you run the risk of aspiration by the baby.

Infection is also a possible complication when dealing with phrenotomy, to avoid it is necessary to keep the surgical field clean and follow the care instructions provided by the health professional. It may happen that the area where the procedure occurred present redness, swelling, severe pain or pus, in which case it is necessary to contact the professional, to better evaluate and find the best way of intervention.

The scar retraction is related to a difficulty of the body in building a new skin. The formation of scars can disrupt the result of the surgical procedure, thus preventing the tongue from being able to perform its movements properly. It is necessary to perform a repeat procedure, or perform other treatment options.

2.6 PHRENOTOMY TECHNIQUES

The frenotomy can be performed can be performed by different techniques being them, the classic, and the laser. (Bissoli et al, 2021)

The classic one is made with tentacanula, to lift the tongue, and metzembaum scissors, which has a curved tip to avoid accidents, has no need for anesthesia. It is a simple procedure where there are risks of bleeding. (Bissoli et al, 2021)

It is also possible to perform it by the laser technique, in which it becomes a faster surgery, with the surgical field cleaner and there is no need for suture. And in the post-surgical period there is a reduction in pain, infection, trauma and scarring. (Tomazini et al, 2017)

3 METHODOLOGY

In order to perform the scientific analysis, 11 of 370 articles were selected in the Scielo and Pubmed databases between 2004 and 2021, using the terms "lingual freno", "ankyloglossia", "breastfeeding" and "frenotomy".

To select the studies, criteria were used that include lingual anatomy, lingual frenulum changes, the consequences caused by these changes, the diagnosis of ankyloglossia, the form of treatment, studies of phrenotomy surgery results, case reports with post-surgical results and the indications for frenotomy.

The exclusion criteria consist of eliminating studies that were not published in Portuguese or English, articles published before 2004, those that do not relate to the topic in question.

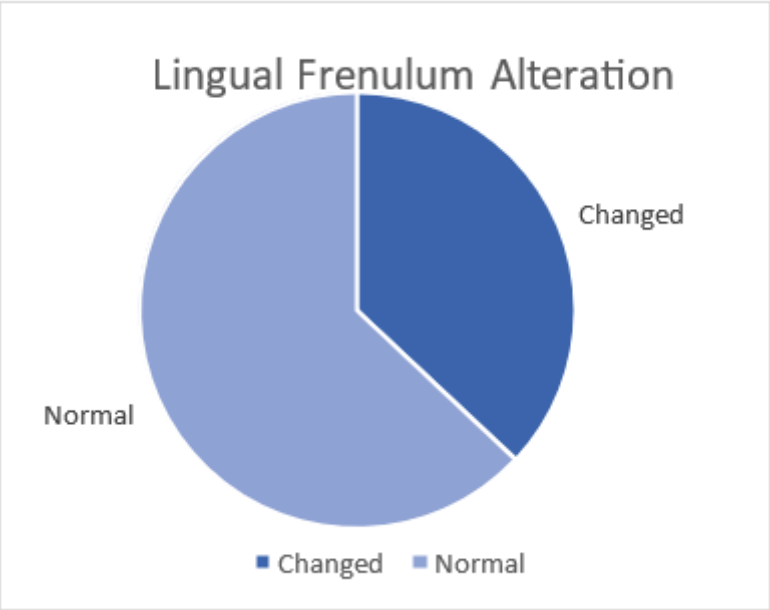
A table with the methods and results of 10 of the selected articles was included in the review, covering subjects relevant to the chosen theme. In summary, the content presented consisted of a description of the consequences of ankyloglossia, as well as treatment options, including phrenotomy surgery and its postoperative results

4 FINDINGS

A study was conducted regarding the type of alteration, 166 patients were included, in which it was observed that 95.1% of the patients had the slender frenulum and 4.8% with the thick frenulum. (Marcione et al, 2016) Of the thick frenulum, 50% had fixation in the middle third/sublingual caruncles and 50% between the middle third and the apex/inferior alveolar crest. (Marcione et al, 2016)

Regarding fixation on the sublingual surface of the tongue and on the floor of the mouth, with regard to the normal frenulums, fixation on the middle third/sublingual caruncles predominated 28%. In the altered frenulum, the highest frequency was with fixation between the middle third and the apex/lower alveolar crest 32.2%. (Marcione et al, 2016)

Table 1



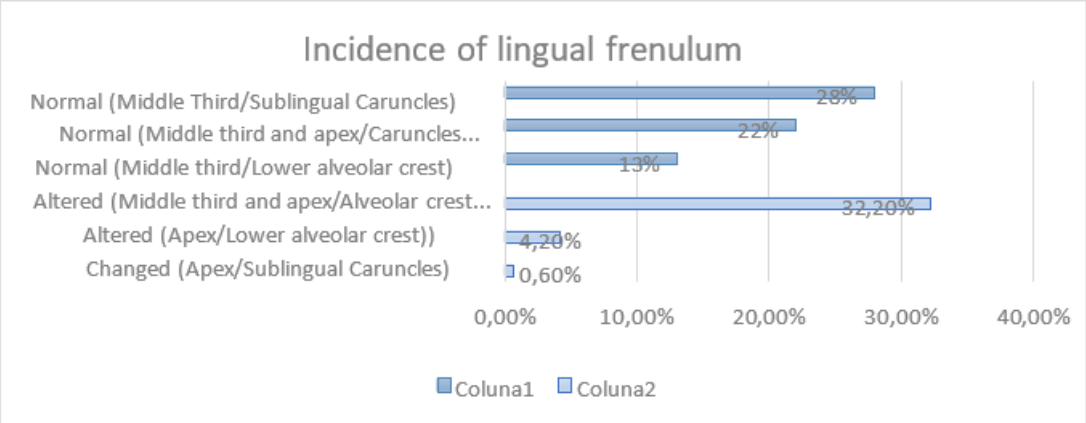


Table 2

Authors	Year	Nature of Research	Methods	Conclusion
Fraga et al	2020	Review of literature	Relationship between ankyloglossia and breastfeeding	Newborns with altered lingual frenulum have higher chances of presenting difficulties in suction and there tendency to have an early weaning.

Marcione et al	2016	Review of literature	Analysis in a baby aged between 1 and 4 months, where it was observed the thickness of frenulum and its fixation on the tongue and floor	In the study it was noted that the frenulum alteration prevailed in the male gender. Infants with altered lingual frenulum were more likely to change in suction, although the correlation between frenulum and suction was low.
Pinto et al	2019	Review of literature	A cross-sectional study was conducted with the professionals of the public network of health of the municipality of Maringá.	The professionals evaluated, the majority, have no knowledge About the Evaluation Protocol of the lingual frenulum. It was also observed the lack of knowledge of the professionals as for oral anatomy. Logo is necessary Teaching for Network health professionals public, focused in the baby's oral cavity.
Gomes et Al	2015	Case report	Male patient, aged 6 years of age, in good general health. Or	The surgical procedure, was favorable and brought anatomical gains

			patient attended a return consultation, but was indicated for a interconsultation with the speech therapist due to the complaint of the mother "talking wrong". Initially in the consultation dental was noticed the brake short lingual, adherent, bulky and limiting movements	and mobility of language, however, there was no speech alteration remained after the intervention requiring the treatment and accompaniment speech-language pathology. Interdisciplinary planning.
Bistaffa et al	2017	Case report	Mother of a patient of 38 days of age, reported pain in the breastfeeding, after the evaluation of the lingual frenum, the patient was diagnosed with ankyloglossia and was indicated of intervention by frenotomy.	In the report, the consequence of the change was: anomalous insertion of the lingual frenum, changed the function breastfeeding of the baby. Surgery of frenotomy of this brake had a favorable prognosis, returning the tongue functions, and the patient presented normality in breastfeeding.
Nogueira et al	2021	Case report	Two cases were evaluated, which had indication of lingual frenotomy, both cases diagnosed with ankyloglossia, to assess whether there was improvement in breast grip and weight gain.	The two reported cases allow conclude that the shorter the time between diagnosis and intervention in ankyloglossia, more effective and easy will be breastfeeding. Is impostante an evaluation interdisciplinary and precocious.

Sanches et al	2004	Review of literature	Clinical management of oral dysfunctions in breastfed children,	Oral dysfunctions can be noticed in a way precocious, before an anamnesis directed, and oral evaluation during the breastfeeding, this Work must be done still in the maternity ward
Martinelli et al	2012	Review of literature	Anatomofunctional aspects of the frenulum and tongue and the proposals for evaluation of nutritional sucking and orofunctional functions.	The frenulum evaluation protocol in infants with Score. The proposal presented can assist the professionals at health to be assessed, and diagnose variations anatomical frenulum and its possible interference with breastfeeding
Lopes et al	2018	Case report	Clinical case of ankyloglossia in newborn. The abduction of information was made in three stages, in the first, the tongue test was performed and diagnosis, in second, photographs of the case and that of the frenotomy and third, accompaniment clinical and photographic of the evolution of the movements of the tongue 7 days after surgery.	The report highlights that the change caused by the anomaly affects the suction, swallowing and tongue movements, and possibly have impact on speech and articulation of words in the near future. Lingual frenulum surgery is a solution that restores the System Functions stomatognathic, providing well-being to the patient.

5 DISCUSSION

The shortening of the lingual frenulum is called ankyloglossia, popularly known as stuck tongue, this shortening causes the limitation of the functions and movements of the tongue, which can be harmful to babies especially in their first months of life, by making it difficult during the breastfeeding phase, and may cause early weaning and weight loss, in addition to causing pain in the mother during breastfeeding. (Costa, et al 2020)

The evaluation for an early diagnosis is important to analyze the best form of intervention in each case. To expedite the diagnosis, currently the "tongue test" is part of the neonatal screening, where it may or may not have the indication of phrenotomy, varying from the result of the evaluation.

According to the evaluation method proposed by Martinelli (2015), which consists of evaluation of clinical history, anatomo-functional evaluation and evaluation of non-nutritive and nutritive sucking. To diagnose and differentiate the anatomical variations of the lingual frenulum, it is necessary a broad knowledge of the lingual anatomy and adjacent areas to find anatomical changes that can hinder the tongue to perform its functions.

Based on a study conducted including all health professionals of the Family Health Strategy Program service providers in the Unified Health System (SUS) of the city of Maringá, placing them to answer a questionnaire based on the clinical protocol recommended by Martinelli, it was observed that health professionals do not have the necessary knowledge about the oral anatomy of the baby, to perform the proper evaluation of the lingual frenum, making it impossible and difficult to diagnose and possible surgical indication. (Pinto, et al 2019)

According to Ballard et al. (2019), who based their study on Hazelbaker's quantitative assessment method, noted that a detailed assessment of lingual functions is necessary to perform surgical intervention of the frenotomy, when indicated appropriately, is effective. This approach has been shown to facilitate breastfeeding in cases of ankyloglossia.

Cho al et al (2005) suggests that the treatment for ankyloglossia in newborns should be carried out if difficulties are identified during breastfeeding.

Because usually babies with mild to moderate ankyloglossia are usually breastfed successfully, so it does not require treatment. However, mothers of babies with any degree of ankyloglossia who have difficulty breastfeeding report immediate improvement after performing the frenotomy in the baby.

It was confirmed by Silva et al (2016) that early diagnosis and intervention, so when frenotomy is performed is a very important step to reduce difficulties during the breastfeeding phase and to avoid future consequences on the development of the child.

In order to determine the occurrence of ankyloglossia in healthy infants and its association with breastfeeding difficulties, Messner et al. (2000) conducted a study in a high-level pediatric hospital. A

total of 1,041 newborns were included in the study, and only those with ankyloglossia were considered. During the research, 50 patients with ankyloglossia were identified. The results indicated that the incidence of ankyloglossia was 4.8%, and nine mothers reported difficulties in breastfeeding. Therefore, it was concluded that ankyloglossia is a common condition in newborns and has a negative impact on breastfeeding.

The study by O'Callahan C et al. (2015) analyzed a group of 311 lactating women to determine the presence of ankyloglossia, and subsequently, 299 of these babies underwent phrenotomy. Most babies were diagnosed with type III (36%) or type IV (49%) ankyloglossia. After the intervention, in interviews conducted, it was reported that there was a significant improvement in the baby's grip and that the pain associated with breastfeeding was reduced in all cases. As a result, it was concluded that frenotomy can minimize breastfeeding difficulties related to ankyloglossia.

By conducting searches in the PUBMED, Medline, and Cochrane Library databases, Power RF et al. (2015) identified a wide variation in ankyloglossia prevalence rates in randomized controlled trials (RCTs). In one of these studies, 316 babies were enrolled for phrenotomy, with no reports of complications resulting from the procedure. However, complications can be avoided or minimized through prior evaluation and in-depth knowledge of the patient's anatomy. From these observations, it was concluded that it is necessary to carry out a careful evaluation and selection before intervening. It is recommended to wait a period of 2 to 3 weeks before performing the intervention, since the results indicate an improvement in breastfeeding of babies diagnosed with ankyloglossia in this time interval. However, it is important to point out that there may be a placebo effect that is difficult to quantify, even if complications are rare.

With the aim of measuring the effectiveness of frenotomy in lactating women, Srinivasan (2016) did a study with lactating women under 12 weeks of age and selected babies based on the phrenotomy rule for breastfed lactating women (FDRBI). The frenotomy was performed after evaluation of grip and pain, the mother also received counseling about breastfeeding during and after the procedure. And it was observed for 3 months. A total of 27 mothers were evaluated, where 92% were pain-free after 3 months, and 88% thought that frenotomy helped. It was soon found that frenotomy and breastfeeding counseling are an effective intervention, improving grip and decreasing nipple pain.

In a study done by Dollberg (2006), where 25 mothers were recruited due to nipple pain during breastfeeding, where they were submitted to one of two sequences (1) frenotomy, breastfeeding, simulation, breastfeeding (14) or (2) simulation, breastfeeding, frenotomy, breastfeeding (11). In both sequences, there was a standardized score of grip and pain. And it was found that frenotomy relieves nipple pain immediately after frenotomy, where it was found that ankyloglossia may be one of the

responsible for the initial difficulty in breastfeeding and that it is an effective treatment to facilitate during this initial period.

O'Shea (2017) also conducted a study with 302 patients, where a standardized assessment of infant breastfeeding was made. In this study it was found that after frenotomy the mothers' pains when breastfeeding were reduced in the short term, and did not find a consistent positive effect on infant breastfeeding. But more study is needed to determine the effects of phrenotomy.

Although phrenotomy is considered a simple surgery, there is evidence of possible surgical complications that should be carefully evaluated before recommending the procedure. Among these complications, infection and hemorrhage stand out, which can occur due to the rupture of the lingual artery. Therefore, it is important to consider these risks and contraindicate phrenotomy when necessary in order to avoid such complications.

6 CONCLUSION

Despite the existence of different opinions among the authors, frenotomy demonstrates positive results in relation to breastfeeding, as it reduces pain and improves breast grip. To avoid any type of complication associated with the procedure, a careful prior evaluation and performance of the frenotomy by trained professionals is necessary.

REFERENCES

MARCIONE, E. S. S. et al. Classificação anatômica do frênulo lingual de bebês. Revista CEFAC, v. 18, p. 1042–1049, 2016.

PINTO, A. B. R. et al. Conhecimento dos profissionais da saúde sobre o diagnóstico e conduta para anquiloglossia em bebês. Saúde e Pesquisa, v. 12, n. 2, p. 233–240, 23 ago. 2019.

LUIS, H. et al. FRENECTOMIA: REVISÃO DE CONCEITOS E TÉCNICAS CIRÚRGICAS Frenectomy: review of concepts and surgical techniques. [s.l: s.n.].

Filho, Jose Maria de Vasconcelos, et al. "Frenotomia Em Crianças Com Anquiloglossia: Um Protocolo de Revisão de Escopo." Research, Society and Development, vol. 11, no. 11, 4 Sept. 2022.

Lima, Anna Letícia Xavier de and Monique Ramos Paschoal Dutra. "Influence of Frenotomy on Breastfeeding in Newborns with Ankyloglossia." CoDAS, vol. 33, no. 1, 2021

Canevassi, Patrícia Maria Barbosa Teixeira. "Movimentos Mandibulares Durante a Fala, Pré E Pós Frenectomia Lingual." Repositorio.ufpe.br, 29 nov. 2019

Izolani Neto, Orlando, et al. FRENECTOMIA: REVISÃO de LTERATURA FRENECTOMY: REVIEW of LITERATURE. Vol. 18, no. 3, 2014, pp. 21–25,

Procopio, Iryana Marques Sena, et al. "Frenotomia Lingual Em Lactentes." Revista Da Faculdade de Odontologia - UPF, vol. 22, no. 1, 28 Aug. 2017

Tomazini, Lara Altoé, et al. "Aplicação de Laser Em Cirurgia de Frenotomia Labial Inferior - Relato de Caso." Full Dent. Sci, 2017, pp. 33–37,

Bissoli, milene. "Língua Presa: Cirurgia Frenotomia No Consultório." Www.youtube.com, 9 Mar. 2021.

Alencar, Cássio José Fornazari, et al. "Frenectomia Lingual Em Bebê Utilizando

Eletrocautério E Tetracaína: Relato de Caso." Rev. Assoc. Paul. Cir. Dent, 2011, pp. 340–345

COSTA, E. F. S. Frenectomia Lingual em neonatos: quando realizar? 2020, 27f. Trabalho de Conclusão de Curso – Escola Bahiana de Medicina e Saúde Pública, Salvador, 2020.

Martinelli RLC, Marchesan IQ, Gusmão RJ, Honório HM, Berretin-Felix G. The effects of frenotomy on breastfeeding. J. Appl. Oral Sci. 2015.

Ballard JL, Auer CE, Khoury JC. Ankyloglossia: Assessment, Incidence, and Effect of Frenuloplasty on the Breastfeeding Dyad. Pediatrics. 2019.

Silva PI, Vilela JER, Rank RCLCR, Rank MS. Frenectomia Lingual Em Bebê: Relato De Caso Lingual Frenectomy in Babies: Case Report. Revista Bahiana de Odontologia. 2016 Set;

O'Shea, Joyce E, et al. "Frenotomy for Tongue-Tie in Newborn Infants." *Cochrane Database of Systematic Reviews*, 11 Mar. 2017,

Srinivasan A, Dobrich C, Mitnick H, Feldman P. Ankyloglossia in breastfeeding infants: the effect of frenotomy on maternal nipple pain and latch. Breastfeed Med. 2006 Winter;1(4):216-24. doi: 10.1089/bfm.2006.1.216. PMID: 17661602.

Dollberg S, Botzer E, Grunis E, Mimouni FB. Immediate nipple pain relief after frenotomy in breast-fed infants with ankyloglossia: a randomized, prospective study. J Pediatr Surg. 2006 Sep;41(9):1598-600. doi: 10.1016/j.jpedsurg.2006.05.024. PMID: 16952598.

Messner AH, Lalakea ML, Aby J, Macmahon J, Bair E. Ankyloglossia: incidence and associated feeding difficulties. Arch Otolaryngol Head Neck Surg. 2000 Jan;126(1):36-9. doi: 10.1001/archotol.126.1.36. PMID: 10628708.

Cho A, Kelsberg G, Safranek S. Clinical inquiries. When should you treat tongue-tie in a newborn? J Fam Pract. 2010 Dec;59(12):712a-b. PMID: 21135930.

O'Callahan C, Macary S, Clemente S. The effects of office-based frenotomy for anterior and posterior ankyloglossia on breastfeeding. Int J Pediatr Otorhinolaryngol. 2013 May;77(5):827-32. doi: 10.1016/j.ijporl.2013.02.022. Epub 2013 Mar 22. PMID: 23523198. Power RF, Murphy JF. Tongue-tie and frenotomy in infants with breastfeeding difficulties: achieving a balance. Arch Dis Child. 2015 May;100(5):489-94. doi: 10.1136/archdischild2014-306211. Epub 2014 Nov 7.

GOMES E; ARAÚJO FB; RODRIGUES JAREV Freio lingual: abordagem clínica interdisciplinar da Fonoaudiologia e Odontopediatria. ASSOC PAUL CIR DENT, v. 69, n. 1, p. 20-4, 2015.

BISTAFFA, A. G. I.; GIFFONI, T. C. R.; FRANZIN, L. C. D. S. Frenotomia Lingual Em Bebê Lingual Frenotomy In Baby. Rev UNINGÁ Review, v. 29, n. 2, p. 18-22, 2017.

Nogueira, Jamille Silva, et al. “Frenotomy: From Assessment to Surgical Intervention.” Revista CEFAC, vol. 23, 2 July 2021,

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Prevalence of healthcare-related infections in an intensive care unit of a teaching hospital in western Paraná

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ABSTRACT
Introduction: Health Care-Related Infection (HAI) is a worrisome event for global public health, due to its high level of morbidity and mortality. Objective: To identify the main bacteria that cause infection in an Intensive Care Unit (ICU) and their sensitivity profiles. Methodology: Retrospective observational cross-sectional study, conducted in patients admitted to the ICU of a Teaching Hospital in the city of Cascavel - PR, in 2021. Results: Most patients were male (70.96%) and the microorganisms were isolated mainly from tracheal secretion (49.46%). Of the total of 186 patients admitted to the ICU, 120 (64.51%) had co-infection with SARS-CoV-2, and of these, 78 (42.29%) died. Of the total of 22 species of bacteria isolated, there was a higher prevalence of Pseudomonas aeruginosa (20.22%), followed by Klebsiella pneumoniae (15.73%) and Staphylococcus aureus (9.55%). Regarding antimicrobial resistance, Pseudomonas aeruginosa presented an average of 65.37% resistance to the drugs tested, followed by Klebsiella pneumoniae (58.45%) and Staphylococcus aureus (37.05%). Conclusion: Pseudomonas aeruginosa was the main isolated bacterium, presenting high resistance to the drugs of the classes of quinolones, penicillins, cephalosporins, nitrofurans and sulfonamides, reaching up to 100% resistance to some antimicrobials tested.

Keywords: HAI, Intensive Care Units, Prevalence, Drug Resistance.

1 INTRODUCTION

The occurrence of infections in patients admitted to the intensive care unit (ICU) is frequent and considered a prerequisite for the development of sepsis, which can lead to death. This is due to the invasive nature of many treatments, such as mechanical ventilation and central venous access, both of which significantly increase the risk of healthcare-related infections (HAIs) in these individuals (Silva et al., 2022). These infections arose a long time ago, and it is stipulated that since the creation of health institutions in the nineteenth century, hospital infections were already present, possibly due to the high

occurrence of numerous infectious diseases that developed at that time, due to the hygienic, health, social and sanitation conditions that surrounded not only the centers of care to the individual, but also the entire population (Ferreira et al., 2010).

The Intensive Care Unit (ICU) is the main nosocomial site where infections are commonly found (corresponding to 30% of infections), and this is mainly due to the conditions in which patients are exposed in this environment, such as the numerous invasive procedures routinely performed and also to their clinical condition. In addition to these procedures, long hospitalization, mechanical ventilation, age, use of immunosuppressants, use of catheters, underlying disease, immune status of the patient and even the submission of these individuals to surgeries are considered factors that corroborate to make this site conducive to infection by microorganisms (Arcanjo & Oliveira, 2017; Lima et al., 2007; ANVISA, 2007).

Contributing to the above scenario, its indiscriminate use of antimicrobials led numerous bacteria to become resistant to this class of drugs, increasing the morbidity and mortality of patients (Loureiro et al., 2016). Many bacterial strains have evolved to be resistant to various antimicrobials (Rigatti et al, 2010). The increased prevalence of bacteria that express resistance to β-lactams and carbapenemases, in addition to the alteration of the cell wall promoting resistance to methicillin, has compromised the therapeutic efficacy of current treatments. Patients hospitalized with infections caused by multidrug-resistant pathogens have a higher risk of receiving inadequate therapy and, consequently, of treatment failure, increasing the burden of disease in ICUs (Karam et al., 2016).

In Latin America, especially in Brazil, the most problematic strains regarding pharmacoresistance are: *Acinetobacter* spp., microorganisms of the *Enterobacteriaceae* family that produce broad-spectrum beta lactamases, *and Pseudomonas aeruginosa* (Oliveira et al, 2017). In addition to many bacteria causing infection, they enter the bloodstream, causing a state of bacteremia. When this state is reached, the patient's situation becomes severe. In this case, there is a high lethality, that is, approximately 35%, which contributes to the increase in hospital costs and the duration of hospitalization of the patient. (Guilarde et al., 2007).

It is worth mentioning that the mortality rate of patients who presented infection is high, reaching 27.88% in Paraná, and in some ICUs of Rio Grande do Sul, 48% (Leiser et al., 2007). Despite these data, in Brazil there are still few studies on HAI. In addition, these data are not consolidated by many hospitals, which makes it difficult to know the real dimension of the problem (Busato et al., 2012). Thus, the aim of the present study was to verify the prevalence of bacterial infection, as well as to analyze the profile of sensitivity to antimicrobials in patients admitted to the ICU of a teaching hospital located in the West of Paraná.

2 METHODOLOGY

This is a quantitative exploratory-descriptive study, based on a careful analysis of data obtained from 186 medical records of patients who were admitted to the ICU of a teaching hospital in Cascavel - Paraná. For data collection from medical records, the following criteria were considered: patient's age, gender, month of ICU admission, length of hospital stay, hospitalization diagnosis, isolated and identified microorganisms, patient evolution, cultures and blood cultures, type of infection and antibiogram result.

The inclusion criteria taken into account for analysis are the medical records in which the patients presented some type of bacterial infection, patients in whom the admission and hospital follow-up form contains elements that satisfy the data collection of the research and patients who have remained hospitalized in the ICU for more than 24 hours, these being of all age groups. Patients who did not present any health-related infection during their ICU stay or who did not contain complete information in order to be carefully analyzed were excluded from the study.

Data collection was performed by verifying documents related to indicators of health-related infection, bacterial cultures and antibiograms performed on hospitalized patients. These data were made available through the management software Tasy, which provides a computerized means of patient care and follow-up. The data were organized and tabulated in Microsoft Excel® and, subsequently, analyzed in SAS (Statistical Analysis Software), version 9.4. The results were expressed as means, standard deviations (± SD) or frequencies. The association between qualitative variables was verified using the Chi-Square or Fisher's Exact tests. Quantitative variables were analyzed using the Wilcoxon test. Statistical significance was set at $p<0.05$. Access to medical records, hospital infection control forms, microbiological examinations of the CCIH (Hospital Infection Control Center) of the Hospital were performed after approval by the Research Ethics Committee of the Assis Gurgacz Foundation - (CEP/FAG) number 5,566,206 of 08/05/2022, meeting the ethical precepts for research involving human beings recommended in Resolution 466/12 of the National Health Council.

3 RESULTS AND DISCUSSION

Of the total of 186 patients, 132 (70.96%) were male. Regarding the age groups, patients aged 0 to 17 years (16 belonged to males and 10 to females), 18 to 59 years (59 belonged to males and 25 to females) and older/equal to 60 years (57 belonged to males and 19 to females). When comparing the indexes of age group and sex, it was verified that these two variables did not have statistical significance ($p>0.05$). Other studies corroborate our findings (Oliveira et al., 2011; Lima et al., 2007).

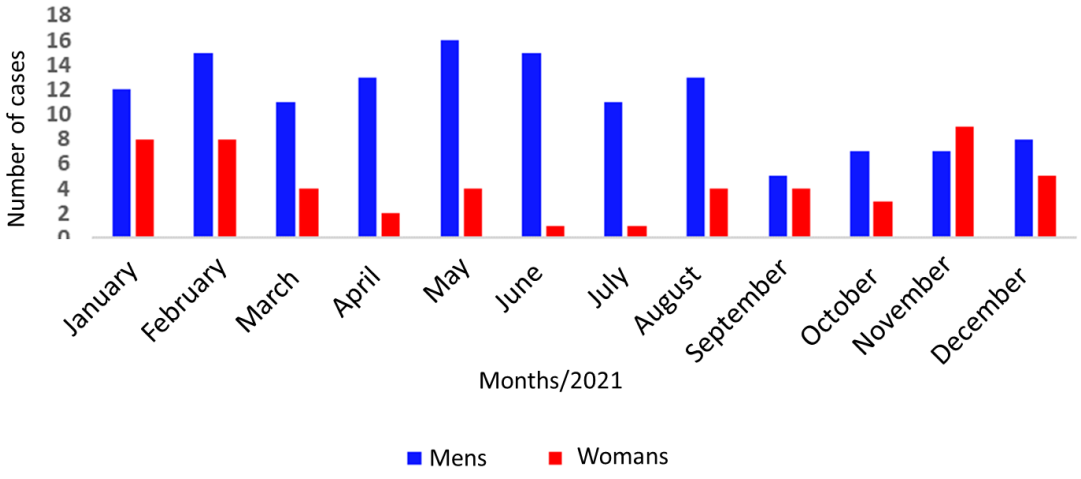
When analyzing the age groups of patients in relation to gender, there was no statistical association between these variables ($p=0.24$). The mean age of all patients admitted to the ICU was 55 years, the median 50.1 years, standard deviation 25.19, and the Inter-Quartile Ratio (RIQ) 26-69 years.

Regarding these same variables, but analyzing the sexes separately, there were male (mean = 51.38 years; median = 55.5 years; standard deviation = 24.87, RIQ = 31-71 years) and female gender (mean = 46.90 years; median = 55.0 years; standard deviation = 25.90 and RIQ = 8-52 years), respectively. Studies by Oliveira et al (2012) and Pereira et al (2016), showed that the mean age among patients admitted to ICUs was 57.3 and 58.3 years, respectively, close to the average found in this study.

During 2021, it was observed that cases of bacterial infection in the ICU in the analyzed hospital did not remain constant (Figure 1). There was an increase at the beginning of the year (January and February), but over the months the number of cases varied. This variability that has occurred can be attributed to the timing of the coronavirus disease (COVID-19) pandemic. A study conducted at the University Hospital of the city of São Paulo showed that healthcare-related infections (HAI) were higher in 2020 than in 2019, in the first year of the SARS-CoV-2 pandemic in the country (Fram et al, 2021).

Regarding the length of stay in the ICU, it was observed that the mean length of stay was 28.1 days, median of 23 days, standard deviation of 22.52 and RQI 12-38.5 days. Similar results in Brazil show that the length of stay was 19.3 days, with a median of 13 days, and 21.2 days for those who developed HAI (Oliveira et al., 2010; Pereira et al, 2016). Given the situation, studies indicate that during the period of the COVID-19 pandemic in Brazil there was an increase in the days of hospitalization due to SARS-CoV-2 infection in a hospital environment, abruptly increasing hospital expenses. In this sense, it is worth remembering that the high period of hospitalization in days in the ICU increases the chance of the hospitalized to acquire a multidrug-resistant pathogen, favoring infection in this environment (Santos et al., 2021; Lisbon & Nagel, 2011).

Figure 1. Number of cases per month of ICU patients divided by sex, in the year 2021

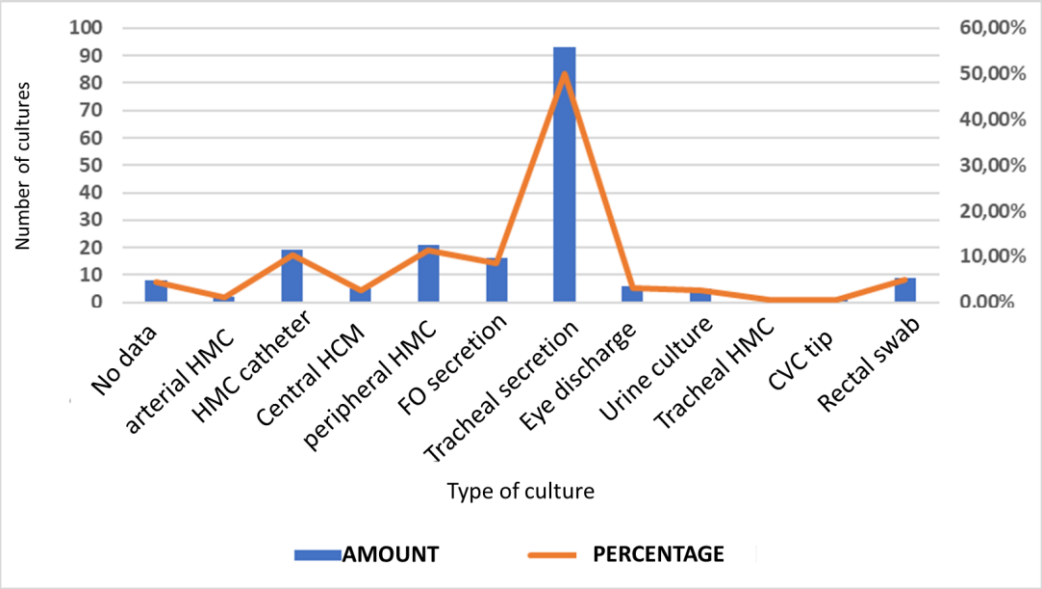


Source: authors (2023)

Regarding the sites of infection, the topography most recorded in the ICU was the respiratory tract (56.45%), followed by infection at the surgical site (15.05%) and catheter-associated bloodstream infection (12.9%). Other topographies such as urinary tract infection, associated bloodstream, skin and soft tissues, among others, did not show significant rates. A result close to that of this study was found in an ICU of the Hospital de Clínicas da Universidade Estadual de Campinas (UNICAMP), in which the most prevalent site of infection was also in the respiratory tract (59%) (Santos et al., 2015). Another study that evaluated the secondary infections that affected patients hospitalized for COVID-19, pointed to the topography of the respiratory tract as the predominant in relation to the other studies. A plausible explanation for this fact is that patients admitted to the ICU receive more intense and invasive management (Baptista, Sousa & Ramos, 2022).

Regarding cultures to identify microorganisms, it was found that tracheal secretion was the most used in relation to the samples analyzed (92; 49.46%), followed by catheter blood culture (19; 10.21%) and peripheral blood culture (18; 9.67%). It is important to emphasize that 8 medical records of patients (4.30%) did not indicate which type of culture was performed for bacterial identification, because the diagnostic criteria used by the Hospital follow the technical norm of ANVISA, since the fact of not having a culture or being negative, does not prevent the professional from the clinical diagnosis of the infection (ANVISA, 2023). According to a study produced in Recife (PE), the main routine cultures for the identification of the pathogen in the ICU are blood cultures, tracheal secretion and rectal swab, the latter being performed when there is no knowledge of the patient's infection (Pires, Nascimento, Siqueira & Silva, 2020). Such data then according to the findings in this study, as illustrated in Figure 2. Blood culture samples and respiratory tract samples deserve special attention, since they are related to bacteremia of high lethality and great importance in terms of morbidity and mortality, respectively (Barros et al, 2012; Calcagnotto et al., 2011).

Figure 2. Cultures performed to isolate the pathogens that infected patients admitted to the ICU in the period of 2021.

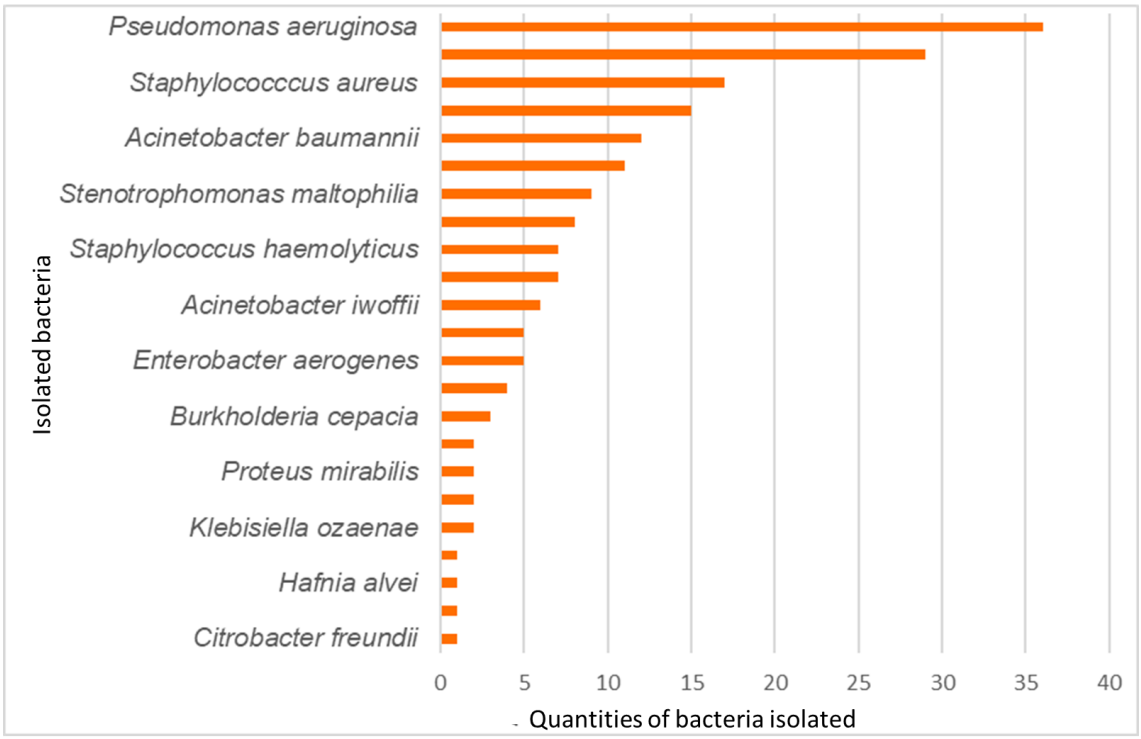


Legend: HMC - Blood Culture, FO Secretion - Surgical Wound Secretion, CVC TIP - Central Venous Catheter Tip;
Source: authors (2023)

Of the 178 microorganisms isolated, the most prevalent were *Pseudomonas aeruginosa* (36; 20.22%), Klebsiella *pneumoniae (28; 15.73%) and* Staphylococcus aureus *(17; 9.55%)*. Other species and subspecies of bacteria were found and are illustrated in Figure 3. A similar result was observed in a study in the ICU of a hospital in Santa Catarina, which recorded a prevalence of 27.9% for *Pseudomonas aeruginosa* and 26.7% for *Klebsiella pneumoniae* (Farias & Gama, 2020). Contributing to the findings, *Pseudomonas aeruginosa* was also the most common pathogen found in another study done at the University Hospital of Fortaleza (Pereira et al., 2015).

Regarding the diagnoses of patients before being admitted to the ICU, it was analyzed that 55 (29.56%) had COVID-19, followed by respiratory tract infections and prematurity, both with 13 (6.98%). A study conducted at the Intensive Care Center of the Public Hospital of the South of Minas Gerais found different results from those observed in our study, with the predominant pathologies: cardiovascular (50%), digestive and genitourinary (41.7%) and respiratory (33.3%) (Cândido et al., 2013). It is important to note that the underlying pathology acts as a favorable factor for the development of infections, suppressing the immune system and facilitating the invasion of pathogens into the host's body (Silva & Rodrigues, 2015).

Figure 3. Prevalence of bacteria isolated from positive biological samples, taken from patients admitted to the ICU, in 2021.



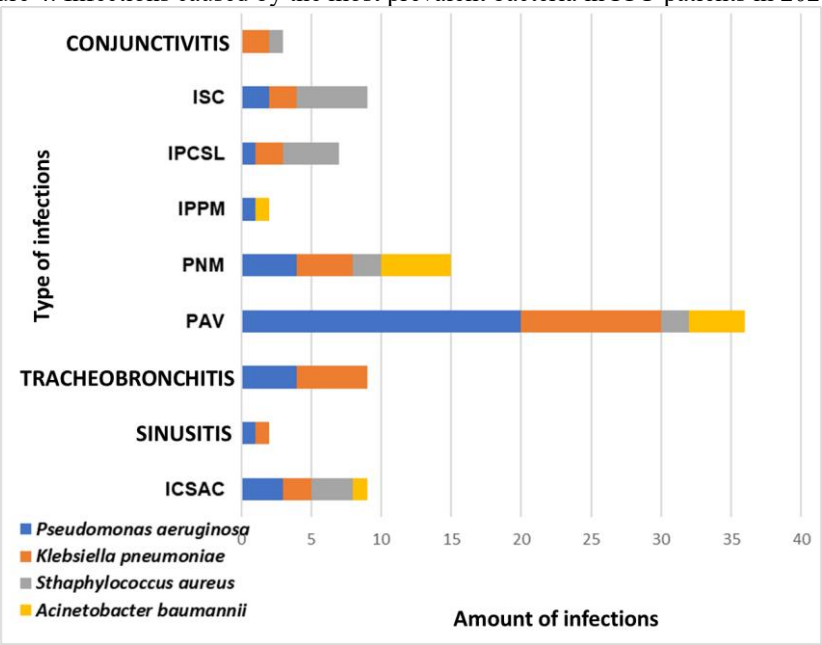
Source: authors (2023)

Regarding the infections caused by the most prevalent bacteria found in our study, it was found that there is a higher prevalence of infections that affect the respiratory tract, as well as ventilator-associated pneumonia, tracheobronchitis and pneumonia were the most frequently found, as shown in Figure 4. According to other results, a research conducted in an intensive care unit of a general and teaching hospital showed that respiratory tract infections were also the ones that most affected individuals hospitalized in this environment (Sousa et al., 2016). Another study points out that more than 94% of those admitted to the ICU of a hospital in Fortaleza (CE) had pneumonia, and of these, 60% were due to mechanical ventilation, data such as these corroborate the finding of this study, and reaffirm the importance of care and management with such individuals so that the mortality rate does not remain high (Bezerra et al., 2012).

Of all the medical records analyzed, 120 (64.51%) and 64 (34.40%) patients were admitted to the ICU with and without SARS-Cov-2 infection, respectively. Two (1.07%) patients' medical records did not contain information about them. Researchers report that ICU patients with a previous diagnosis of the novel coronavirus have increased chances of bacterial, viral, and also fungal co-infections and superinfections, which can lead to severe health conditions and poor prognosis during their hospitalization (Fernandes et al., 2021). Figure 5 illustrates the dynamism of hospitalizations of patients hospitalized for COVID-19 in the hospital unit under study, in which an exponential increase can be observed at the beginning of the year, this fact can be attributed to some factors, such as: high

and intense dissemination, viral transmissibility and also by the lack of effectiveness of vaccination (Covre et al., 2022).

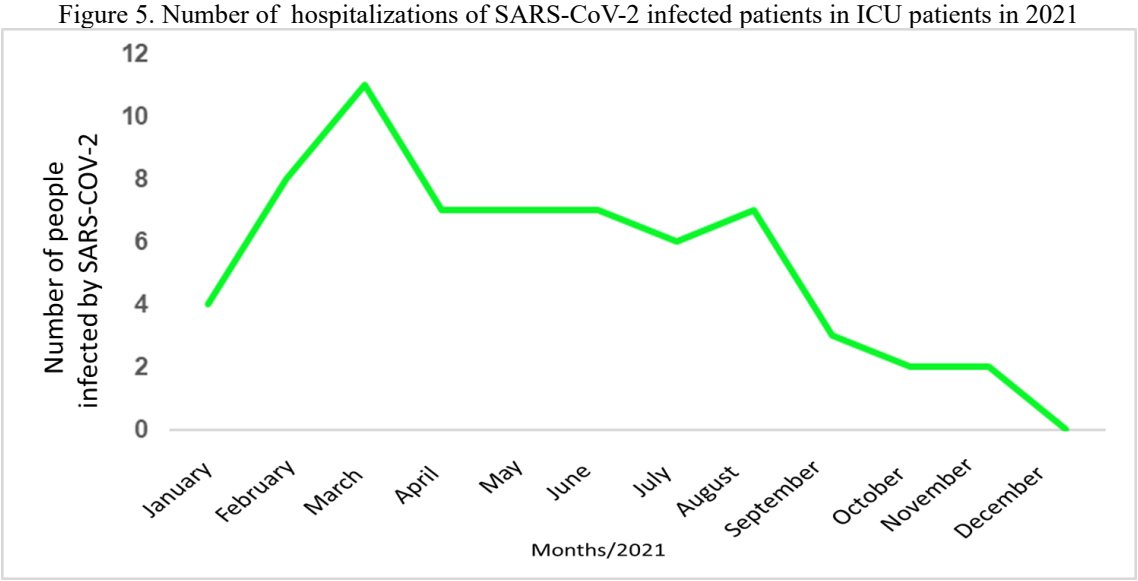
Figure 4. Infections caused by the most prevalent bacteria in ICU patients in 2021.



Legend: Mechanical Ventilation, PNM - Pneumonia, IPPM - Skin and Soft Tissue Infection, IPCLS - Primary Laboratory Bloodstream Infection, SSI - Confirmed Surgical Site Infection.

Source: authors (2023)

Figure 5. Number of hospitalizations of SARS-CoV-2 infected patients in ICU patients in 2021



Source: authors (2023)

Regarding the hospital evolution of those admitted to the ICU of the hospital, it was analyzed that 93 (50.54%) people were discharged from the hospital, that is, they recovered from the infectious process and/or the reason that led to hospitalization. 78 (42.29%) people died due to their clinical conditions, 10 (5.43%) people remained hospitalized and 3 (1.63%) were transferred to other health institutions for reasons not ascertained. It is worth mentioning that two medical records did not contain

necessary information that would indicate the clinical outcome of the patient during hospitalization. Studies show that the mortality rate is high in patients who are under ICU care and can vary from 9 to 38% (Rodrigues & Pereira, 2016).

Pseudomonas aeruginosa was the most prevalent bacterium in the present study.

Regarding the P. aeruginosa *susceptibility test* to antimicrobial drugs, there was an average of 65.37% of resistance to the antimicrobials tested (Table 1), a value higher than that found in a medium-sized hospital in Rio Grande do Sul, which was 50% (Basso et al., 2016). In another study conducted in a reference hospital in infectology in Amazonas, it was found that the resistance of *P. aeruginosa* to carbapenems was 33.3% (Gima et al., 2020). These data differ from our study, because this same bacterium presented a low rate of resistance to this class of antimicrobials, a factor that may be linked to the intrinsic means of the bacterium itself, through mutation during its cell cycle and even acquired by adding genetic material from another microorganism (Costa & Junior, 2017).

It can be verified that the average resistance to the antibiotics tested for *Klebsiella pneumoniae* was 58.45%. Table 1 shows that for some antimicrobials this strain is highly resistant such as aztreonam, cefepime, ceftriaxone and ampicillin and strongly sensitive to amikacin. Similar results were found in a study conducted in western Pará (Gato et al., 2022), *Klebsiella pneumoniae* is capable of producing extended-spectrum β-lactamases (ESBL), a class of enzyme that leads to resistance to many antibiotics, thus becoming highly resistant, generating alerts in units that provide intensive care (Perna et al., 2015).

With an average resistance of 37.05% to the drugs tested, it was possible to verify, according to Table 1, a high rate of resistance, especially for the penicillin class. The findings of this study corroborate those found in a review study with data from several hospitals in Brazil that found that *Staphylococcus aureus* has high resistance to drugs of the penicillin class, including oxacillin (Bôtelho et al., 2022). The reason for this finding is explained by the ability of *Staphylococcus aureus* to inactivate β-lactam antibiotics. This process involves the action of β-lactamase enzymes, which break down the β-lactam ring of penicillins and cephalosporins. It is important to note that some strains of this bacterium have developed resistance to certain antimicrobials, even those that are not necessarily inactivated by β-lactamase. This is due to the presence of an extra β-lactam-binding protein, which is encoded by a mutated chromosomal gene (Cussolim et al., 2021).

4 CONCLUSION

The most prevalent bacteria in the ICU of the hospital under study were *Pseudomona aeruginosa* and *Klebsiella pneumoniae*, as well as the respiratory tract was identified as the main site of infection. In addition, there was a high number of SARS-CoV-2 infected patients who were infected by various bacteria, contributing to the high mortality rate observed. Regarding the antimicrobial

resistance of the most prevalent bacteria, *Pseudomonas aeruginosa* with resistance of 65.37% to the drugs tested, as well as *Klebsiella pneumoniae* (58.45%) and *Staphylococcus aureus* (35.07%). It is worth mentioning that the bacterial and antibiogram profile found of the infections is particular to the hospital under study, and may even be extrapolated to other hospitals, but with due care. In addition, our results can draw a microbiological profile specific to the ICU, and it is possible to guide which antimicrobials should be empirically instituted. Thus, it is possible to obtain a greater therapeutic effect and less tendency to the emergence of multidrug-resistant microorganisms, as well as a reduction in the length of stay and hospital costs of patients hospitalized in this environment. Further research should be done on this topic and clinical considerations should be undertaken for the rational use of antimicrobials in the ICU in order to maintain the effectiveness of such treatments and prevent the emergence of microbial resistance.

Table 1. Sensitivity profile of microorganisms to different drugs

Pseudomonas aeruginosa	***Klebsiella pneumoniae***	***Staphylococcus aureus***						
Antibiotic (class)	**Number of samples evaluated n (%)**	**Resistant isolates in the evaluated samples n (%)**	**Antibiotic (class)**	**Number of samples evaluated n (%)**	**Resistant isolates in the evaluated samples n (%)**	**Antibiotic (class)**	**Number of samples evaluated n (%)**	**Resistant isolates in the evaluated samples n (%)**
quinolones	10 (27,77)	10 (100)	Aminoglycoside	25 (86,20)	1 (4)	Penicillin / β-lactamase Inhibitor	14 (82,35)	7 (50)
Aminoglycosides	31 (86,11)	9 (39,03	Penicillin / β-lactamase Inhibitor	8 (27,58)	5 (62,5)	penicillin	14 (82,35)	13 (92,85)
Penicillin / β-lactamase Inhibitor	10 (27,77)	10 (100)	Penicillin / β-lactamase Inhibitor	8 (27,58)	8 (75)	Cephalosporin	14 (82,35)	7 (50)
Penicillin / β-lactamase Inhibitor	10 (27,77)	10 (100)	penicillin	25 (86,20)	25 (100)	fluoroquinolone	14 (82,35)	5 (35,71)
penicillin	23 (63,88)	23 (100)	Monobactams	25 (86,20)	21 (84)	lincomicidal	14 (82,35)	6 (42,85)
Monobactams	19 (52,77)	17 (89,47)	Cephalosporin	8 (27,58)	6 (75)	Cyclic lipopeptide	10 (58,82)	0 (0)
Cephalosporin	10 (27,77)	10 (100)	Cephalosporin	24 (82,75)	19 (79,16)	macrolide	14 (82,35)	9 (64,28)
Cephalosporin	30 (83,33)	22 (73,33)	Cephalosporin	8 (27,58)	6 (75)	Aminoglycoside	14 (82,35)	5 (35,71)
Cephalosporin	11 (30,55)	11 (100)	Cephalosporin	8 (27,58)	5 (62,5)	fluoroquinolone	14 (82,35)	5 (35,71)
Cephalosporin	10 (27,77)	10 (100)	Cephalosporin	15 (51,72)	12 (80)	Oxazolidinone	14 (82,35)	0 (0)
Cephalosporin	31 (86,11)	19 (61,29)	Cephalosporin	25 (86,20)	20 (80)	penicillin	14 (82,35)	7 (50)
Cephalosporin	10 (27,77)	10 (100)	Cephalosporin	8 (27,58)	6 (75)	penicillin	14 (82,35)	13 (92,85)
Quinolone	29 (80,55)	11 (37,93)	fluoroquinolone	23 (79,31)	16 (69,56)	Glycopeptides	14 (82,35)	1 (7,14)
Polymyxin	30 (83,33)	0 (0)	Polymyxin	25 (86,20)	0 (0)	Tetracycline	14 (82,35)	1 (7,14)
Carbapenem	4 (11,11)	0 (0)	Carbapenem	25 (86,20)	10 (40)	Sulfonamide	14 (82,35)	4 (28,57)
Phosphonate	31 (86,11)	27 (87,09)	Phosphonate	25 (86,20)	14 (56)	Glycopeptides	14 (82,35)	0 (0)
Aminoglycoside	31 (86,11)	18 (58,06)	Aminoglycoside	25 (86,20)	13 (52)			
Carbapenem	31 (86,11)	1 (3,22)	Carbapenem	25 (86,20)	9 (36)			
Quinolone	31 (86,11)	13 (41,93)	fluoroquinolone	25 (86,20)	17 (68)			
Carbapenem	31 (86,11)	1 (3,22)	Carbapenem	25 (86,20)	11 (44)			
nitrofuran	10 (27,77)	10 (100)	nitrofuran	5 (17,24)	3 (60)			

Quinolone	9 (25)	3 (33,33)	fluoroquinolone	7 (24,13)	4 (57,14)			
Penicillin / β-lactamase Inhibitor	31 (86,11)	20 (64,52)	Penicillin / β-lactamase Inhibitor	25 (86,20)	15 (60)			
Aminoglycoside	31 (86,11)	13 (41,93)	Glycylcycline	8 (27,58)	0 (0)			
Sulfonamide combined with Trimetropine	10 (27,77)	10 (100)	Aminoglycoside	24 (82,75)	14 (58,33)			
			Sulfonamide	9 (31,03)	6 (66,66)			

Source: authors (2023)

REFERENCES

Agência Nacional de Vigilância Sanitária (ANVISA). Investigação e controle de bactérias multirresistentes. Brasília: Ministério da Saúde; 2007.

Agência Nacional de Vigilância Sanitária (ANVISA). Manual de Microbiologia Clínica para o controle de infecção em serviços de saúde. Brasília: Ministério da Saúde; 2004.

Agência Nacional de Vigilância Sanitária (ANVISA). NOTA TÉCNICA GVIMS/GGTES/DIRE3/ANVISA N 03 / 2023. Critérios Diagnósticos das infecções relacionadas à assistência à saúde (IRAS) de notificação nacional obrigatória para o ano de 2023.Brasília: Ministério da Saúde; 2023.

Arcanjo, R., & Oliveira A. C. D. (2017). Fatores associados à colonização axilar por microrganismo resistente em pacientes na unidade de terapia intensiva. Rev Aten Saúde, 15(51), 11-17. https://doi.org/10.13037/ras.vol15n51.3941

Baptista, A. B., Sousza, D. F., & Ramos, L. F. (2022). INFECCIONES SECUNDARIAS EN PACIENTES INGRESADOS POR COVID-19 EN UN HOSPITAL PÚBLICO DE TOCANTINS, BRASIL. DESAFIOS - Revista Interdisciplinar Da Universidade Federal Do Tocantins, 9(2), 12–21. https://doi.org/10.20873/uftv9-12058

Barros, L. M., Bento J. N. C., Caetano, J. A., Moreira, R. A. N., Pereira, F. G. F., Frota, N. M., Araújo, T. M., & Soares, E. (2012). Prevalência de micro-organismo sensibilidade antimicrobiana de infecções hospitalares em unidade de terapia intensiva de hospital público no Brasil. Revista de Ciências Farmacêuticas Básica e Aplicada, v. 33(3), 429-435.

Basso, M. E., Pulcinelli, R. S. R., Aquino, A. R. C., & Santos, K. F. (2016) Prevalência de infecções bacterianas em pacientes internados em uma unidade de terapia intensiva (UTI). RBAC, 48(4), 383-388. DOI:10.21877/2448-3877.201600307

Bezerra, E. L., Lima, A. I. F., Nóbrega, A. R. R., Barroso, D. da N., Donadi, H. A., Santos, J. G. de S., Freitas, M. M. C., & Parente, H. M. A. (2012). Prevalência de pneumonia em pacientes de uma unidade de terapia intensiva de um hospital-escola de Fortaleza - CE. Revista Brasileira Em Promoção Da Saúde, 25(2 Supl), 20–24. https://doi.org/10.5020/2240

Bôtelho, E. X., Melo, R. O. A., Gusmão, N. B., Ximenes, R. M.F., & Sena, K. X. F. R. (2022). Prevalence and antimicrobial resistance profile of Staphylococcus aureus in Brazilian hospitals: an integrative literature review. Research, Society and Development, v. 11(6), 1-13. https://doi.org/10.33448/rsd-v11i6.28744

Calcagnotto, L., Nespolo, C. R., & Stedile, N. L. R. (2011). Resistência antimicrobiana em microrganismos isolados do trato respiratório de pacientes internados em unidade de terapia intensiva. Arq Catarin Med, 40(3), 77-83.

Cândido, R. B. R., Souza, W. A., Podestá, M. H. M. C., Rocha, J. R., Siqueira, V. M. S., Souza, W. C., Pereira., C. A. S., & Ferreira, E. B. (2013). Avaliação das infecções hospitalares em pacientes críticos em um Centro de Terapia Intensiva. Revista da Universidade Vale do Rio Verde, 10(2), 148-163. http://dx.doi.org/10.5892/ruvrd.v10i2.610.g615

Costa, A. L. P., & Junior, S. (2017). Resistência bacteriana aos antibióticos e Saúde Pública: uma breve revisão da literatura. Estação Científica (UNIFAP), v. 7, n. 2, p. 45. https://doi.org/10.18468/estcien.2017v7n2.p45-57.

Covre, E. R., Pereira, N. D., Oliveira, N. N., Charlo, P. B.,Oliveira, M. L. F., Oliveira, R. R., Carreira, L., Facchini, L. A., Vissoci, J. R. N., & Salci, M. A. (2022). Correlação espacial da covid-19 com leitos de unidades de terapia intensiva no Paraná. Revista de Saúde Pública, 56(14), 1-11. https://doi.org/10.11606/s1518- 8787.2022056003868

Cussolim, P. A., Junior, A. S., Melo, A. L., & Melo, A. Mecanismos de resistência do Staphylococcus aureus a antibióticos. Revista faculdades do saber, v. 6, n. 12, p. 831-843, 2021.

Farias, C. H., & Gama, F. O. (2020). Prevalência de infecção relacionada à assistência à saúde em pacientes internados em unidade de terapia intensiva. Revista De Epidemiologia E Controle De Infecção, 10(3). https://doi.org/10.17058/reci.v10i3.15406

Fernandes, T. P., Abreu, C. M., Rocha, J. O., Bianchetti, L. O., Sales, L. A.,Alves, M. Q., Prates, M. E., Lemes, N. M., Vieira, S. D., & Corrêa, M. I. (2021). Infecções secundárias em pacientes internados por COVID-19: consequências e particularidades associadas. Revista Eletrônica Acervo Científico, 34, 8687- 8687. https://doi.org/10.25248/reac.e8687.2021

Ferreira, N. L. V., Nolasco M. L., & Espíndula B. M. (2010). Principais infecções hospitalares que se desenvolvem nas unidades de terapia intensiva e quais os procedimentos básicos para evitar sua proliferação. Revista eletrônica de enfermagem, 1-16.

Fram, D. S., Ferreira, D. B., Matias, L. O., Coelho, W. E., Escudero, D. V., Antonelli, T. S., & Medeiros E. A. (2021). Perfil epidemiológico das IRAS notificadas em um hospital universitário durante a pandemia da COVID-19. The Brazilian Journal of Infectious Diseases. DOI: 10.1016/j.bjid.2020.101063

Gato, P. C., Maia, A. L., Santos, K. A. S., Santos, L. A., & Silva, E. M. R. (2022). Perfil de resistência bacteriana da klebsiella pneumoniae na unidade de terapia intensiva em um hospital de ensino no Oeste do pará no período de 2018 a 2019 / Klebsiella pneumoniae bacterial resistance profile in the intensive care unit in a teaching hospital in west pará during 2018 to 2019. Brazilian Journal of Development, 8(1), 1208–1225. https://doi.org/10.34117/bjdv7n12-650

Gima, M. B. S., Côrrea, J. S., Correa, M. S. O., Neto, J. G. H., Teixeira, J. P., Marques, R. B., Andrade, M. G. F. S., & Azevedo, A. P. de. (2020). Características microbiologicas e perfil de resistencia de microrganismos causadores de infecções hospitalar em uma UTI para pacientes pediátricos de um hospital referencia em infectologia do Amazonas / Microbiological characteristics and resistance profile of micro-organisms causing hospital infections in an ICU for pediatric patients in a hospital references in Amazon infectology. Brazilian Journal of Health Review, 3(4), 8663–8678. https://doi.org/10.34119/bjhrv3n4-114

Guilarde, A. O., Turchi M. D., & Martelli C. M. T. (2007). Bacteremias em pacientes internados em hospital universitário. Revista Associação Médica Brasileira, 53(1), 34-38. https://doi.org/10.1590/S0104-42302007000100016

Leiser, J. J., Tognim M. C.B., & Bedendo J. (2007). Infecções hospitalares em um centro de terapia intensiva de um hospital de ensino no norte do Paraná. Ciência, Cuidado E Saúde, 6(2),181-186. https://doi.org/10.4025/ciencuidsaude.v6i2.4149

Lima, M. E., Andrade D. D., & Haas V. J. (2007). Avaliação prospectiva da ocorrência de infecção em pacientes críticos de Unidade de Terapia Intensiva. Revista Brasileira de Terapia Intensiva, 19(3),342-347. https://doi.org/10.1590/S0103-507X2007000300013

Lisboa, T., & Nagel, F. (2011). Infecção por patógenos multi-resistentes na UTI: como escapar. Rev Bras Ter Intensiva, 23(2), 120-124, https://doi.org/10.1590/S0103-507X2011000200003

Loureiro, R. J., Roque, F., Rodrigues, A.T., Herdeiro, M.T., & Ramalheira, E. (2016). O uso de antibióticos e as resistências bacterianas: breves notas sobre a sua evolução. Rev Port Saúde Púb, 34(1), 77-84. https://doi.org/10.1016/j.rpsp.2015.11.003

Oliveira, A.C., Kovner, C.T., & Silva R.S. (2010). Infecção hospitalar em unidade de tratamento intensivo de um hospital universitário brasileiro. Rev. Latino-Americana Enfermagem, 18(2), p. 97-104. https://doi.org/10.1590/S0104-11692010000200014

Oliveira, A.C., Paula, A.O., Iquiapaza, R., & Gama, C. S. (2017). Perfil dos microrganismos associados à colonização e infecção em Terapia Intensiva. Rev Epid Control Infec, 7(2), 101-106. https://doi.org/10.17058/reci.v7i2.8302

Oliveira, T.F.L., Filho, I.S.G., Passos, J.S., Cruz, S. S., Oliveira, M. T., Trindade, S. C., Machado, A. S., Coelho, J. M. S., Santos, C. M. L., & Cerqueira, C. M. M. (2011). Factors associated with nosocomial pneumonia in hospitalized individuals. Journal Brazilian Medical Association, 57(6), 630-636. https://doi.org/10.1016/S2255-4823(11)70126-6

Pereira, F. G. F., Chagas, A. N. S., Freitas, M. M. C., Caetano, J. A., & Barros L. M. (2016). Caracterização das infecções relacionadas à assistência à saúde em uma Unidade de Terapia Intensiva. Vigilância Sanitária em Debate: Sociedade, Ciência & Tecnologia, 4(1), 70-77. Doi: 10.3395/2317-269x.00614

Perna, T. D. G. S., Puiatti, M. A., Perna, D. H., Pereira, N. M. M., Couri, M. G., & Ferreira, C. M. (2015). Prevalência de infecção hospitalar pela bactéria do gênero klebsiella em uma Unidade de Terapia Intensiva. Revista da Sociedade Brasileira de Clínica Médica, v. 13, p. 119-123.

Pires, C. T. R., Nascimento, M. E. O., Siqueira, R. M., & Silva, R. G. S. (2020). Perfil epidemiológico de crianças com cultura positiva para microorganismo multirresistente internadas em um hospital escola de Recife-PE. Revista Eletrônica Acervo Saúde, 1-19. https://doi.org/10.25248/reas.eXX.2019

Rigatti, F., Tizotti, M. K., Hörner R., Domingues, V. O., Martini, R., Mayer, L. E., Khun, F. T., França, C. A. D., & Costa, M. M. D. (2010). Bacteremias por Staphylococcus coagulase negativos oxacilina resistentes em um hospital escola na cidade de Santa Maria, Estado do Rio Grande do Sul. Revista da Sociedade Brasileira de Medicina Tropical, 43(6), p. 686-690. https://doi.org/10.1590/S0037-86822010000600017

Santos, H.L.P.C., Maciel, F.B.M., Junior, G.M.S., Martins, P.C., & Prado, N.M.L.B. (2021). Gastos públicos com internações hospitalares para tratamento da covid-19 no Brasil em 2020. Rev Saude Publica, 55:52. https://doi.org/10.11606/ s1518-8787.2021055003666

Santos, R. B., Duran, E. C. M., Carmona, E. V., Melo, L. L., & Beck A. R. M. (2015). Diagnósticos de enfermagem em pacientes com infecção hospitalar. Rev. enferm UFPE on line., 9(8), 9359-9365. https://doi.org/10.5205/1981-8963-v9i8p9359-9365

Silva, B. B. L. da; Alves, A. K. R.; Serejo junior, F. das C. da S.; Lima, G. V. de S.; Lima, T. R. C. C.; Brito, F. E. V ; Rodrigues, Érika, P. de S. M. .; Coelho , Ítallo da S. .; Costa , L. M. de A. L. .; Brandão , B. L. . Factors associated with the development of healthcare-associated infections in the intensive care unit: a literature review. Research, Society and Development, [S. l.], v. 11, n. 5, p. e14711528125, 2022

Silva, J. V. F., & Rodrigues, A. P. R. A. (2015). A infecção nosocomial em unidade de terapia intensiva neonatal. Caderno de Graduação-Ciências Biológicas e da Saúde-UNIT-ALAGOAS, 3(1), 129-138.

Sousa, A. F. F. L., Oliveira, L. B., & Moura, M. E. B. (2016). Perfil epidemiológico das infecções hospitalares causadas por procedimentos invasivos em unidade de terapia intensiva. Revista Prevenção de Infecção e Saúde, 2(1-2), 11-17. https://doi.org/10.26694/repis.v2i1-2.6048

Ethics applied to medical students: Challenges for a new generation of health professionals

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ABSTRACT
The Code of Ethics of the Medical Student is a fundamental tool to guide the ethical conduct of future physicians from the beginning of their training. This article discusses the importance of this code in the development of medical professionals committed to sound ethical principles and respect for the values of the profession. The code of ethics provides comprehensive guidelines for medical students, addressing areas such as integrity, respect for the patient, confidentiality, social and scientific responsibility, and relationship with other health professionals. In addition to establishing behavioral standards, the code also emphasizes the importance of self-reflection and continuous ethical improvement. Adherence to the code of ethics contributes to the training of compassionate and ethical physicians, who not only possess advanced medical knowledge, but also understand the moral responsibility inherent in the profession. By internalizing these values from their formative years, medical students are more likely to act with empathy, honesty, and respect when caring for their patients. In addition, the medical student's code of ethics promotes a culture of ethics and responsibility, positively impacting the environment of medical teaching and practice. Applying these principles not only benefits patients, but also strengthens trust in the medical profession as a whole. In conclusion, the Code of Ethics of the Medical Student plays a crucial role in the training of future ethical and competent physicians. By incorporating ethical principles from the beginning of their academic journey, medical students are better prepared to meet the complex challenges of medical practice, while always maintaining the highest standards of ethics and integrity.

Keywords: Ethics, Health, Medicine, Training.

1 INTRODUCTION

Ethics plays a key role in the training and practice of medical students, since these future professionals will be responsible for the care of the health and well-being of patients. In this context, the elaboration and adherence to a specific code of ethics for medical students is extremely important to ensure proper conduct during their training and medical career. Authors such as Beauchamp and Childress (2013) emphasize the relevance of medical ethics based on principles such as autonomy, beneficence, non-maleficence, and justice.

The code of ethics for medical students serves as a guide to direct their ethical actions and decisions throughout the learning and practice process. In it, the essential values that should guide the behavior of students are outlined, promoting integrity, empathy and respect. The doctor-patient

relationship is built on trust, and medical students must learn from an early age to cultivate this trust through exemplary ethical behavior (HAIDET et al., 2002; HAIDET; STEIN, 2006; GAUFBERG et al., 2014).

In addition, the code of ethics for medical students addresses the importance of academic and scientific honesty, underscoring the need to avoid data falsification and plagiarism. Integrity in research and clinical practice is essential to maintaining the credibility of the medical profession (BIONI, 2020; DANTAS; NOGAROLI, 2020).

The relationship between students and teachers is also contemplated in the code of ethics, highlighting the importance of mutual respect and collaboration. Authors such as Cruess and Cruess (2008) emphasize that ethics in medical education involves not only the proper treatment of patients, but also the healthy relationship between members of the health team.

It is worth mentioning that the code of ethics for medical students is not static and should be reviewed periodically to adapt to changes in society, medicine and emerging ethical practices. Authors like Veatch; Haddad and English (2014), stress the importance of addressing contemporary ethical dilemmas, such as patient privacy in a digitized world and issues of equity in access to health care.

2 THE CODE OF ETHICS OF THE MEDICAL STUDENT (CEEM)

The Code of Ethics of the Medical Student (CEEM) is a document prepared by the Federal Council of Medicine (CFM) in 2018, which establishes the principles and ethical guidelines to be followed by medical students during their academic training and professional practice.

The importance of the EMEC lies in several aspects:

Ethical guidance: The code provides clear guidelines and ethical guidelines to medical students, helping them to understand and internalize the fundamental ethical principles that should guide their professional conduct. This contributes to the training of professionals committed to medical ethics and the provision of quality health care.

Integral training: The CEEM is not limited only to technical and scientific aspects of medicine, but also covers the integral formation of the student, valuing humanistic aspects, the doctor-patient relationship, social responsibility and health promotion. This broad approach contributes to a more complete and sensitive training to the needs of patients.

Respect for patients' rights: The code emphasizes the importance of respecting the dignity, autonomy, and rights of patients. This includes a duty to preserve the confidentiality of information, obtain informed consent, respect privacy, and make decisions based on the best interest of the patient. These principles are fundamental to an ethical and humanized medical practice.

Social responsibility: CEEM highlights the social responsibility of medical students in relation to community health and equity in access to health services. This encourages students to engage in

health promotion activities, disease prevention and action in underserved areas, contributing to the improvement of the health conditions of the population.

Standardization of conduct: The code establishes a set of ethical principles common to all medical students, regardless of the educational institution in which they are enrolled. This promotes the standardization of ethical conduct and cohesion in the exercise of the profession, avoiding disparities and ensuring a high ethical standard throughout medical education.

The following are 15 important points of this code.

1. The medical student must respect human life in all its forms, seeking to preserve, promote and restore the health of individuals.
2. It is essential that the student exercises his profession with responsibility, competence, honesty and diligence, always prioritizing the well-being of the patient.
3. Professional secrecy is an essential principle. The student must keep secret all confidential information obtained in the exercise of the profession.
4. Respect for the patient's autonomy and dignity is paramount. The student must always inform and obtain the free and informed consent of the patient before any procedure.
5. The student must ensure their continuous training and constant updating, seeking to improve their technical and scientific knowledge.
6. It is forbidden for the medical student to discriminate or practice any form of violence or prejudice against patients, colleagues of the profession or anyone involved in health care.
7. Honesty is an essential value. The student must provide correct, accurate and transparent information to patients, avoiding any form of deception or falsehood.
8. It is forbidden for the medical student to use his knowledge or position to obtain undue personal advantage or harm other professionals.
9. Respect for the academic environment and hierarchy is important. The student should treat his or her peers, faculty, and other staff members with respect, courtesy, and collaboration.
10. It is the duty of the student to actively participate in educational, clinical and scientific activities, demonstrating interest and commitment to learning.
11. The student must recognize their limits and seek support whenever necessary, ensuring the safety and quality of patient care.
12. Scientific research should be conducted with ethics and respect for established norms, ensuring data integrity and the privacy of participants.
13. The student should avoid conflicts of interest that could compromise their impartiality and independence in clinical decision-making.
14. It is essential that the student denounces any ethical violation witnessed or practiced by other professionals, aiming at the protection of the rights and well-being of patients.

15. The student must contribute to the improvement of the health system, participating in discussions and proposals aimed at improving the quality and accessibility of medical care.

3 CONCLUSION

The Code of Ethics of the Medical Student is extremely important, as it provides a solid ethical basis for the training of future doctors, guiding them in making ethical decisions, in the relationship with patients and in the promotion of health. By internalizing these ethical principles from the beginning of their education, students will be better prepared to practice medicine in a responsible, compassionate, and ethical manner throughout their careers.

REFERENCES

Beauchamp TL, Childress JF. Principles of biomedical ethics. 7ª ed. New York: Oxford University Press; 2013.

Bioni, BR. Consentimento e a (re)avaliação de seu papel normativo na proteção de dados pessoais. In: BIONI, Bruno Ricardo. Proteção de dados pessoais: a função e os limites do consentimento. 2. ed. Rio de Janeiro: Forense, 2020. parte II.

Conselho Federal de Medicina. Código de ética do estudante de medicina / Conselho Federal de Medicina. – Brasília, DF: CFM, 2018.

Cruess RL, Cruess SR. Expectations and obligations: professionalism and medicine's social contract with society. Perspect Biol Med. 2008 Autumn;51(4):579-98.

Dantas, E; Nogaroli, R. Consentimento informado do paciente frente às novas tecnologias da saúde: telemedicina, cirurgia robótica e inteligência artificial. Lex Medicinae – Revista Portuguesa de Direito da Saúde, ano. 17, n. 33, jan./jun. 2020. p. 25-63.

Gaufberg E, Hirsh D, Krupat E, et al. Into the future: Patient-centredness endures in longitudinal integrated clerkship graduates. Med Educ. 2014; 48: 572-582.

Haidet P, Dains JE, Paterniti DA, et al. Medical student attitudes toward the doctorpatient relationship. Med Educ. 2002; 36: 568-574.

Haidet P, Stein HF. The role of the student-teacher relationship in the formation of physicians: the hidden curriculum as process. J Gen Intern Med. 2006; 21: S16-20.

Veatch RM, Haddad AM, English DC. Case Studies in Biomedical Ethics: Decision-Making, Principles, and Cases. 2ª ed. New York: Oxford University Press, USA; 2014.

Post cholecystectomy syndrome caused by cystic duct remnant: A case report

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ABSTRACT

CASE PRESENTATION: Patient, M.R., male, 51 years old, attended the general surgery outpatient clinic of UNESC complaining of bulging in the right inguinal region and pain on exertion with results of imaging studies suggesting the presence of cholelithiasis. Previous pathological history of laparotomy cholecystectomy 12 years ago, due to diagnosis of acute lithiasic cholecystitis. In view of the case, ultrasonography of the total abdomen was requested, which showed echogenic images with posterior acoustic leftover in the gallbladder topography. In view of the above, computed tomography of the upper abdomen was performed, which found the presence of an image compatible with a hypoplastic neogallbladder, with a thickened wall, containing a 1.5 cm calculus. From the results acquired through imaging exams, it was decided to investigate through cholangioresonance that identified filling failure measuring 1.2 cm in topography of the gallbladder next to the hepatic hilum, maintaining contact and bulging the first duodenal portion measuring 2.2 x 1.8 cm, suggesting a lithiasic biliary neovesicle. From the confirmation of the diagnosis, laparotomy cholecystectomy was indicated. Intraoperatively, an image compatible with a gallbladder of about 3 cm with thin walls and calculus inside was observed. The cystic duct, dissection of the Calot triangle without evidence of cystic artery and ligation of the remaining cystic duct were identified and repaired. The patient evolved with the usual postoperative period and after perishing all criteria was discharged. DISCUSSION: Videolaparoscopy is currently the gold standard treatment for symptomatic cases of cholelithiasis. However, some patients report the persistence or recurrence of some gastrointestinal symptoms associated with abdominal pain, which may begin 2 to 25 years after surgical intervention. These cases are described as Postcholecystectomy Syndrome (PCS). As suggested to the patient in question, once a residual calculus or neovesicle is diagnosed, surgical intervention should be performed to resolve the symptoms and avoid possible complications. FINAL CONSIDERATIONS: Patients undergoing cholecystectomy with persistence or recurrence of gastrointestinal symptoms should undergo imaging tests to rule out or confirm the diagnosis of neovesicle.

Keywords: Neovesicle, Cholecystectomy, Bile Duct.

1 INTRODUCTION

The Cholecystectomy is the most common surgery for symptomatic gallstones and laparoscopic surgery is the gold standard choice for it. However, some patients may persist with symptoms such as pain and dyspepsia after surgery. This situation is described as post-cholecystectomy syndrome (PCS) whose frequency varies in the literature from 5 to 30%. [1, 2]

PCS is defined as the continuation or recurrence of symptoms similar to those prior to surgery. The main complaints are upper abdominal pain, associated with gastrointestinal symptoms such as indigestion, nausea, vomiting, jaundice and diarrhea. The syndrome can start in 2 days or up to 25 years. [2]

This occurs due to residual stones in the remnant of the gallbladder due to partial cholecystectomy or in the particularly long cystic duct. Poor visualization during laparoscopic surgery, severe inflammation and dense adhesions in the acute phase of the disease, excessive bleeding, and confusing morphology of the gallbladder are the reasons for incomplete resection of the gallbladder. Therefore, proper dissection and identification of the gallbladder and cystic duct junction are necessary for complete removal of the gallbladder and prevention of post-cholecystectomy syndrome. [1]

Therefore, patients undergoing cholecystectomy with persistence or recurrence of gastrointestinal symptoms should undergo imaging tests to rule out or confirm the diagnosis of neovesicle. Therefore, the objective of this case was to describe the importance of surgical intervention in patients diagnosed with neovesicle to avoid complications. [2]

2 CASE REPORT

Patient M.R, male, 51 years old, referred to the general surgery outpatient clinic, complaining of bulging in the right inguinal region and results of post-cholecystectomy control imaging tests. Among the exams, computed tomography of the total abdomen, showing the presence of an image compatible with a hypoplastic neogallbladder, with a thickened wall, containing a calculus of about 1.5 cm.

The patient underwent cholecystectomy 12 years ago due to acute lithiasis cholecystitis and reports an uneventful postoperative period. It also states that every year it performed routine examinations and that in 2022 there were changes in liver enzymes. Therefore, the attending physician requested total abdominal ultrasonography in which she evidenced the presence of echogenic images with posterior acoustic shadow in the gallbladder topography (Figure 1). For this reason, he suggested computed tomography of the upper abdomen. He was then referred to the service where he underwent computed tomography of the abdomen previously mentioned. Then cholangioresonance with identification of bile ducts of normal caliber, without irregularities, dilatations or filling failures, oval

image of thin walls and high signal content on T2-weighted sequences with low signal foci, filling failures measuring 1.2 cm, located in the topography of the gallbladder next to the hepatic hilum, maintaining contact and bulging the first duodenal portion, measuring 2.2 x 1.8 cm, and may correspond to neogallbladder with stones inside.

Figure 1: Ultrasonography of the abdomen with a finding compatible with calculus in gallbladder topography



Due to the surgical diagnoses, cholecystectomy and right inguinal hernioplasty were indicated. As for management, despite the superiority of the laparoscopic technique, the conventional technique may be advantageous in these cases in which the scar tissue has the potential to hinder a safe laparoscopic dissection, and therefore opted for this method.

In the procedure, a right kocher incision was made following a previous incision involving skin and subcutaneous tissue, the inventory of the abdominal cavity showed multiple adhesions, compatible image of gallbladder of about 3 cm with thin walls and calculus inside, liver of normal appearance and rest of the cavity without alterations (Figure 2). Therefore, cystic duct repair was identified and performed, dissection of the triangle of calot without evidence of the cystic artery, ligation of the cystic duct with cotton thread 2 - 0 and cholecystectomy itself (Figure 3), in addition to sending a specimen for histopathological examination (Figure 4).

Figure 2: Intraoperative image showing the presence of a compatible gallbladder image



Figure 3 – Reflecting image illustrating the cholecystectomy itself

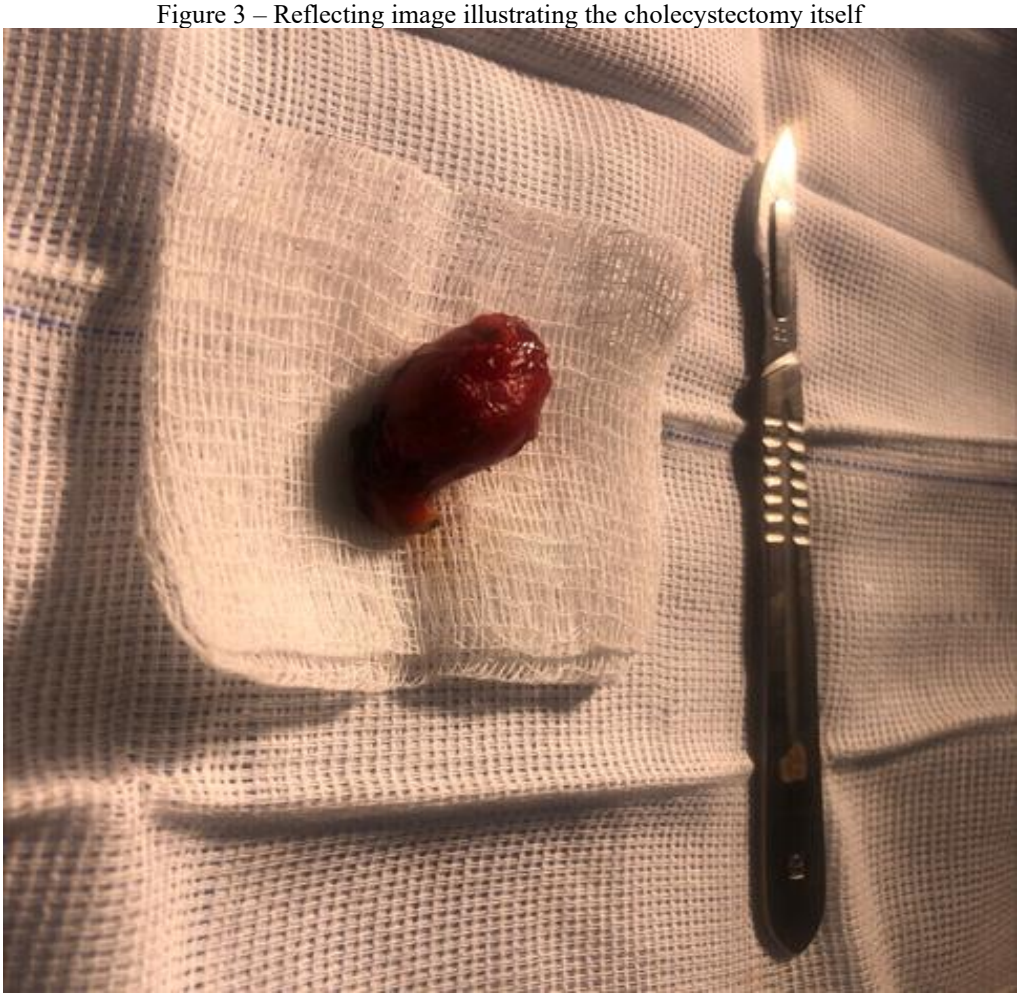


Figure 4 – Specimen sent to histopathology



The patient evolved with the usual postoperative period and after meeting all the criteria, he was discharged.

3 DISCUSSION

Cholecystectomy, laparoscopic or as open surgery, is the standard of care for symptomatic gallstones. It provides total relief of symptoms in up to 85% of patients. However, some patients may experience upper abdominal pain similar to those prior to surgery, a condition known as post-cholecystectomy syndrome (PCS). [1, 3]

Post-cholecystectomy syndrome (PCS) comprises several conditions that present as recurrence of symptoms prior to cholecystectomy. The onset of the disease can be as short as 2 days and as long as 25 years. The disorder is more common in women. These disorders can be classified as extra-biliary and biliary. Most causes are attributed to extrabiliary causes such as peptic ulcer, reflux esophagitis, chronic pancreatitis, hepatitis, diverticulitis, mesenteric ischemia, and irritable bowel syndrome. Biliary causes include biliary stenosis, age of bile leakage, retained or recurrent gallstones, cystic duct remnant, dyskinesia of the sphincter of oddi and neuroma in the surgical bed. [1, 5]

Uncertain local anatomy, adhesions of the cystic pedicle, severe inflammation can lead to a partial cholecystectomy or a longer cystic duct. Partial cholecystectomy may be accompanied by remaining gallstones or formation of new stones that results in post-cholecystectomy syndrome. [1, 4]

The diagnosis of CPS can be made by means of ultrasound, endoscopic ultrasound, endoscopic retrograde cholangiopancreatography (ERCP), CT and MRCP. Frequently, abdominal ultrasound is the first method of investigation for the clinic of the patient with post-cholecystectomy syndrome. [1, 5]

In our report, ultrasonography reveals echogenic images with posterior acoustic shadow in vesicle topography. For this reason, he suggested computed tomography of the upper abdomen, which found the presence of an image compatible with a hypoplastic biliary neovesicle with a thickened wall, containing a 1.5 cm calculus. Subsequently, we opted for the investigation through cholangioresonance, which confirmed the diagnosis of PCS and was indicated, thus, the performance of surgical treatment by laparotomy cholecystectomy.

Once a patient has been diagnosed as having residual calculus, surgical intervention should be performed. Surgery should involve proper dissection and identification of the gallbladder and cystic duct junction to ensure complete removal of the gallbladder and thus resolve symptoms and avoid life-threatening complications such as carcinoma, recurrent cholangitis, mucocele formation, and Mirizzi syndrome. [1, 4]

4 CONCLUSION

The post-cholecystectomy syndrome can be a challenge for diagnosis and treatment. Careful and thorough surgery helps reduce the possibility of cystic duct remnants leading to post-cholecystectomy syndrome. Thus, patients undergoing cholecystectomy with persistence or recurrence of gastrointestinal symptoms, clinical history of recurrent biliary colic resembling the pain for which the initial cholecystectomy was performed should be suspected of remnants of the gallbladder. These patients should undergo careful evaluation, rule out non-biliary causes, and imaging tests should also be performed to rule out or confirm the diagnosis of neogallbladder.

REFERENCES

Zahedian A., Ahangar S. K., Asghari Y. Post cholecystectomy syndrome need to redo laparoscopic completion surgery: a case report. *International Journal of Surgery Case Reports.* (2018) 42:145–147. (PubMed PMID: PMC5985252)

Wafa Ben Hmida, Hichem Jerraya, Souhir Nasseh, Nabil Haloui, Mehdi Khalfallah, Ramzi Nouira, The complications of subtotal cholecystectomy: A case report, International Journal of Surgery Case Reports, (2021) (PubMed:PMCID: PMC8134978)

Om Tantia, Mayank Jain, Shashi Khanna, Bimalendu Sem, Post cholecystectomy syndrome: Role of cystic duct stump and re-intervention by laparoscopic surgery, Journal of Minimal Access Surgery (Julho a setembro) (2008) Volume 4 (Pubmed PMID: 19547688)

RC Popescu, N Leopa, A Dumitru, Cristina D, Alexandru D, Razvan B, E Iordache, Florin Botea et al, Residual Gallbladder and Cystic Duct Stump Stone after Cholecystectomy: Laparoscopic Management, Chirurgia (2021) 116: 484-491(Pubmed PMID: 34498567)

PRIYANK S C et al., Cystic duct remnant: a rare cause for postcholecystectomy syndrome, BJR case reports. (2017) (Pubmed PMID: 30363197)

Duplicate cystic duct: A case report

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ABSTRACT

INTRODUCTION: The cystic duct is one of the bile ducts responsible for the conduction of bile and together with the common hepatic duct make up the cystohepatic trine. The accessory hepatic ducts are those that have undergone anatomical variation and evaginate out of the liver. An example of this is the double cystic duct that presents with an incidence of 1 in 4,000 to 5,000 people. This duplication is classified as an exceptional surgical finding, and its diagnosis, for the most part, is made during surgery. It can even lead to iatrogenic lesions. This fact is justified mainly because its symptomatology is indistinguishable from cases in which there is no variation. CASE PRESENTATION: Patient V.M.S.N, 47 years old, complained of asthenia and epigastric pain for about two years. In consultation with the gastroenterologist, Upper Digestive Endoscopy was requested, which identified positivity for Helicobacter Pylori, hiatal hernia and moderate enanthematous gastritis. The patient was submitted to clinical treatment, but was unsuccessful. Upon returning to the doctor, a Total Abdomen Ultrasound was requested, which exposed mild hepatic steatosis, calculus in the left kidney, and cholelithiasis. Thus, she was referred to the general surgery outpatient clinic and laparoscopic cholecystectomy was indicated. During the surgical procedure, three structures confluent to the gallbladder were identified, opting for intraoperative cholangiography, which showed the presence of an accessory cystic duct. In view of the above, the cystic duct, accessory duct and cystic artery were repaired, and they were ligated. DISCUSSION: It is noted that this is an uncommon anatomical abnormality and is a great challenge for surgeons, marking the risk of iatrogenic lesions during the procedure. Therefore, the preoperative diagnosis and elucidation with the performance of intraoperative cholangiography are extremely important in order to avoid complications. FINAL CONSIDERATIONS: The finding of accessory cystic duct is an atypical condition that exhibits clinical and radiological polymorphism and, therefore, of difficult preoperative diagnosis. Still, it was not observed in the literature the use of specific complementary tests that would lead to the early diagnosis of such pathology. Currently, the accurate diagnosis of cystic duct duplication is established intraoperatively in order to exclude lesions of the main biliary tract, which reduces the chances of the patient presenting complications, thus providing a better quality of life.

Keywords: Gallbladder, Cystic Duct, Anatomical Variation.

1 INTRODUCTION

The liver is the largest gland and the second largest organ in the human body, its weight is about 1,500 g and represents approximately 2.5% of the adult body weight. In addition to performing various metabolic activities, the liver secretes bile, a yellow-brown liquid that assists in the process of emulsifying fats. Bile leaves the liver through the right and left hepatic ducts, which join the cystic duct from the gallbladder to form the common bile duct. (MOORE et al., 2013)

Accessory or aberrant hepatic ducts are the collecting bile ducts of the intrahepatic triad that undergo evagination out of the liver, giving rise to the right and left hepatic ducts. This process occurs due to the anatomical variation of these triad ducts, which prolong and become extrahepatic. It is worth mentioning that in surgeries where there is presence of accessory ducts, if there is accidental injury, there is an accidental outflow of bile. (MOORE et al., 2013) Thus, for full diagnostic and therapeutic success, it is of paramount importance that the surgeon has a detailed knowledge of the extrahepatic bile ducts, as well as their variations, because the prompt recognition of certain pathologies makes surgical approaches more accurate and effective. (CACHOEIRAS et al., 2012)

An example of these variations is the duplication of the gallbladder, which can come with or without duplication of the associated cystic duct. This anatomical variation is a rare congenital anomaly, the incidence of which is approximately one in every 4000 to 5000 births. BOYDEN, et-al., 1926). It is also important to emphasize that structural changes in the cystic and hepatic ducts represent a great challenge for surgeons, since the absence of immediate knowledge of the morphology or outflow of the ducts can create confused ideas and increase the propensity to obstruct any of the ducts. (CACHOEIRAS et al., 2012).

2 CASE REPORT

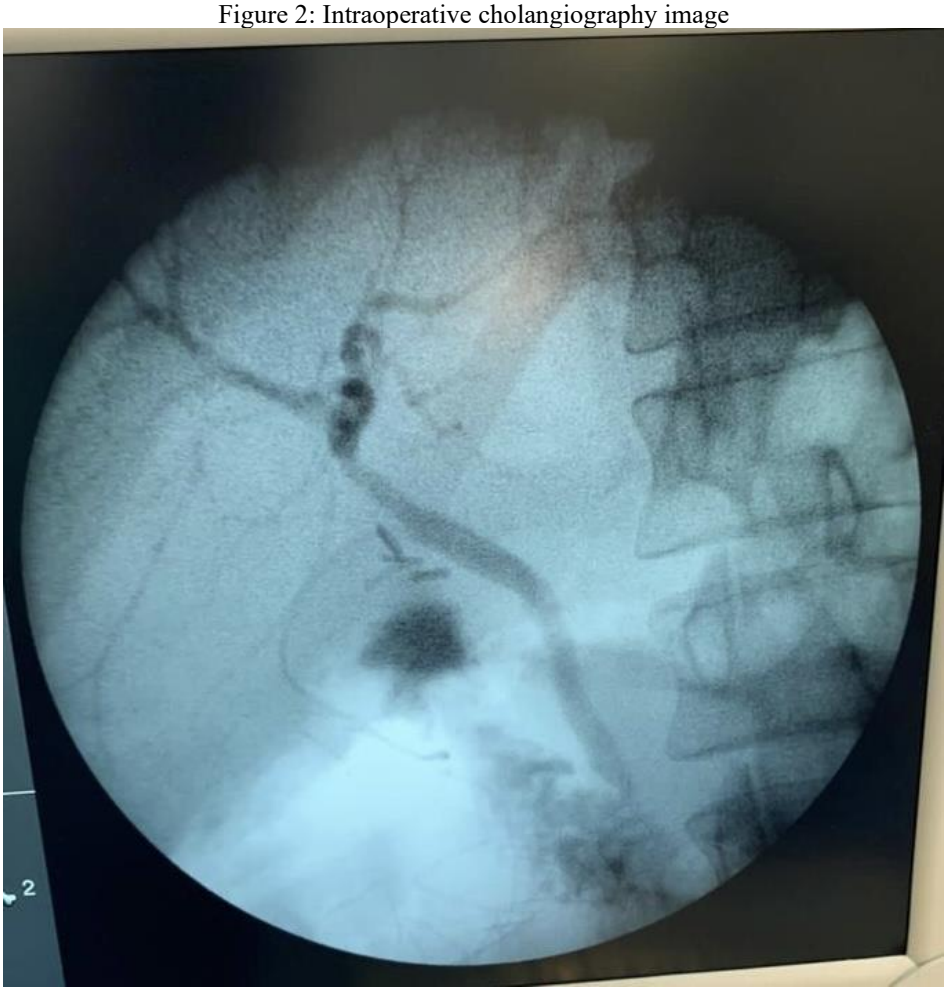
Patient V.M.S.N, 47 years old, complained of asthenia and epigastric pain for about two years, and therefore consulted with a gastroenterologist in the city of Iuna-ES. The same requested Upper Digestive Endoscopy that identified positivity for Helicobacter Pylori, hiatal hernia and moderate enanthematous gastritis (Figure 1). After clinical treatment with antibiotic use for Helicobacter Pylori, without success, he returned to the specialist who requested, in turn, Total Abdomen Ultrasonography that demonstrated mild hepatic steatosis, calculus in the left kidney and cholelithiasis - presence of mobile stones measuring up to 0.5 cm.

Figure 1: image showing cholelilithiasis - presence of mobile stones measuring up to 0.5 cm.



Laparoscopic cholecystectomy was then indicated due to the superiority of the technique compared to the conventional technique. In the procedure, the initial laparoscopy showed smooth-walled vesicle with no acute signs of cholecystitis and no other abnormalities. Dissection of the gallbladder pedicle was performed identifying three structures confluent to the gallbladder. Due to the inconclusive dissection, intraoperative cholangiography was chosen. On examination, the free main biliary tract and accessory cystic duct were evidenced (Figure 3).

Figure 2: Intraoperative cholangiography image



In view of what was found, the cystic duct, accessory and cystic artery were repaired and ligated. Finally, detachment of the gallbladder from the hepatic bed, revision of hemostasis and closure by planes, with sending of specimen for histopathological examination (Figure 4). The patient evolved with the usual postoperative period and after meeting all the criteria, he was discharged.

Figure 3 – Specimen sent to histopathology



3 DISCUSSION

Abnormalities of the bile ducts characterize a great challenge to surgeons, as well as may represent an increased risk of injury during cholecystectomy, due to the lack of immediate recognition of these variations. (CADURO, A.B et-al., 2014).

In 1929, Boyden described a system for classifying gallbladder duplications. Within this classification, it includes bilobated gallbladder, which contains a cystic duct and true duplication of the gallbladder. The latter, in turn, is subclassified into "type Y", grouping two cystic ducts that join before entering the common bile duct and "H-shaped" or "ductular type" that aggregates two cystic ducts that enter separately into the common bile duct. . (BOYDEN, et-al., 1926).

The most commonly used classification today was described by Harlaftis et al. It comprises type I, which includes a primordial septate, V-shaped, and finally Y-shaped gallbladder with two cystic ducts but draining into the common bile duct through a single common cystic duct; type II anomalies, the most common include accessory gallves, meaning there are two separate gallves, each with its own cystic duct draining independently into the common bile duct (type H) or with one of the cystic ducts draining into the right or left hepatic duct (trabecular type). (HARLAFTIS et-al., 1977).

The diagnosis of these abnormalities can be made during the preoperative act, by means of imaging tests, such as abdominal ultrasound and computed tomography. However, such screening is often not performed, since the symptomatology of a patient with double cystic duct is indistinguishable

from cases in which there is no duplication of the structure. Thus, most patients are referred for surgery without recognition of the anomaly. In the course of surgery, the surgeon should always perform an intraoperative cholangiography to make sure of the integrity of the main bile duct in order to avoid iatrogenic lesions.

During the surgery of the patient reported in this case, 03 structures were visualized in the pedicle of the gallbladder and intraoperative cholangiography was chosen to elucidate the picture. On examination, it was evidenced that the main biliary tract was free and that the patient presented an anatomical variation, with the presence of an accessory cystic duct. Then, the main cystic duct, the accessory and the cystic artery were repaired, and they were ligated. (CADURO, A.B et-al., 2014).

In this sense, it is observed the importance of establishing an accurate diagnosis of the accessory cystic duct in the operative act. Thus, even in the intraoperative period, the appropriate identification of anatomical variation is an appropriate approach that can prevent most iatrogenic lesions of the bile ducts. (CADURO, A.B. et-al., 2014).

4 FINAL CONSIDERATIONS

The finding of an accessory cystic duct is an atypical condition that clinical and radiological polymorphism and is therefore difficult to diagnose preoperatively. The literature has not yet revealed the use of specific complementary tests that would lead to an early diagnosis of this pathology. Currently, the of cystic duct duplication is established intraoperatively in order to exclude lesions of the main bile duct, which reduces the chances of the patient presenting complications, thus providing a better quality of life.

REFERENCES

CAUDURO, A. B. *et al*. O papel da colangiografia intraoperatória na identificação imediata das variações das vias biliares. GED, São Paulo, v. 33, n. 4, p. 138-140, mai./2014.

BOYDEN, Edward A. The accessory gall-bladder–an embryological and comparative study of aberrant biliary vesicles occurring in man and the domestic mammals. American Journal of Anatomy, v. 38, n. 2, p. 177-231, 1926).

CACHOEIRA, Eduardo; RIVAS, Antonio; GABRIELLI, Carla. Anatomic variations of extrahepatic bile ducts and evaluation of the length of ducts composing the cystohepatic triangle. International Journal of Morphology, v. 30, n. 1, p. 279-283, 2012.

HARLAFTIS, Nicholas; GRAY, S. W.; SKANDALAKIS, J. E. Multiple gallbladders. Surgery, gynecology & obstetrics, v. 145, n. 6, p. 928-934, 1977.

MOORE, Keith L.; DALLEY, Arthur F.; AGUR, Anne MR. Moore anatomia orientada para a clínica. Guanabara koogan, 2014.

SEVEN
publicações acadêmicas

Effects of different intervention proposals in individuals with metabolic syndrome of Southern Brazil

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ABSTRACT
Background: Metabolic Syndrome (MetS) has increased in all ethnicities and age groups of the world population. Understanding the effects of different exercise programs on MetS risk factors is necessary for the control of the syndrome. Objective: The objective of this study was to analyze the effects of different intervention proposals on individuals with MetS. Methods: Participants were 69 adults, of both sexes, with a mean age of 52.44±2.22 years and a medical diagnosis of MetS, from a city in southern Brazil. Five physical training proposals were tested: Combined Training without Nutritional Monitoring; Combined Training with Nutritional Monitoring; Strenght Training; Aerobic Interval Training; Functional Training. Individuals were evaluated before and after interventions in anthropometric, hemodynamic, functional and biochemical aspects. Results: The methods with the greatest number of effects were Aerobic Interval Training, followed by Combined Training with Nutritional Monitoring. The waist circumference variable reduced only in the Aerobic Interval Training method ($p<0.05$). Conclusions: Aerobic Interval Training was the most efficient in modifying the risk factors for MetS.

Keywords: Heart disease risk factors, exercise movement techniques, metabolic, diseases.

1 INTRODUCTION

The Metabolic Syndrome (MetS) is a worldwide public health problem that is associated with changes in eating habits and lifestyle stimulated by urbanization. MS increases the risk of developing type 2 diabetes mellitus (DM2), twice cardiovascular disease morbidity and mortality (CVD) over a period of up to 10 years, two to four times the risk of cerebral vascular accident (CVA) and three to four times the risk of myocardial infarction (MI)[1]. The development of MetS has been described as a complex combination, through altered carbohydrate and lipid metabolism, blood pressure levels, central fat deposition and insulin resistance, representing a set of cardiovascular risk factors,[1] which can be aggravated by the pro-inflammatory state, hormonal imbalance, genetic profile, physical inactivity and aging.[2]

The prevalence of MetS is strongly dependent on the criteria used for the diagnosis, as well as on the ethnic and regional characteristics of the population studied, which gives it a high degree of variability.[3] Studies in several populations have shown that the prevalence of MetS is high and can vary between 15% and 62%.[4-12] Another factor that interferes with prevalence rates is the lack of unanimity in the definition and cut-off points of its components.[13]

Among the strategies for the prevention and treatment of this syndrome are the fight against obesity and the increase in the levels of physical activity. First-line therapy for the treatment of individuals with MetS should be initiated by encouraging lifestyle changes through dietary re-education and physical exercise.[14] It has been proven that this association causes significant reduction of waist circumference (WC) and visceral fat, decreases glucose (GLU), triglycerides (TG) and blood pressure (BP), improves insulin sensitivity and increases high Density Lipoprotein Cholesterol (HDL-c).[15]

The recommendations for physical exercise practice established by the American Heart Association - AHA and American College of Sports Medicine - ACSM are clear as to the duration and intensity that should be applied to the sessions.[16] However, there is little literature on methodological intervention proposals, specific for individuals with MetS, who present the description of the physical training applied and its main results. Understanding the effects of different exercise programs on the risk factors leading to MetS is relevant to the control of the syndrome. Thus, the objective of this study was to analyze the effects of different intervention proposals on individuals with MetS.

2 METHODS

2.1 SUBJECTS

The study groups consisted of 69 adults, of both sexes, with a mean age of 52.44±2.22 years and a medical diagnosis of MetS, from a city in the South region of Brazil. The recruitment of the individuals was carried out by means of publicity in the local printed media and by the institutional webpage of the university where the interventions took place. Participants who, during the training period, changed the medication, suffered some musculoskeletal injury that interfered or did not perform the exercises and did not attend 15% or more of the sessions of the training program, were excluded from the analysis, according to the period. This study is registered at CNS/MS (Brazil), available in http://aplicacao.saude.gov.br/plataformabrasil under the Presentation Certificates for Ethical Assessment nº 57249916.3.0000.5346 and Sight nº 0032.0.243.000-07.

2.2 INTERVENTION PROGRAMS

The intervention programs tested for MetS were composed of the following proposals of physical training: a) Combined Training without Nutritional Monitoring (CTr); b) Combined Training with Nutritional Monitoring (CTrN); c) Strenght Training (STr); d) Aerobic Interval Training (AITr); e) Functional Training (FTr), distributed according to Table 1 and described as follows.

Table 1 - Intervention programs for Metabolic Syndrome.

Intervention Programs		Time (weeks)	Participants (n)
CTr	Combined Training without Nutritional Monitoring	15	12
CTrN	Combined Training with Nutritional Monitoring	15	12
STr	Strenght Training	15	10
AITr	Aerobic Interval Training	8	18
FTr	Functional Training	12	17

Legend: Intervention programs: summary description of the method applied; Time: number of weeks of training; Participants: number of individuals.

2.3 COMBINED TRAINING WITHOUT NUTRITIONAL MONITORING

Sessions, performed three times a week, over a period of 15 weeks. After the initial dynamic stretching with body warm-up, 30 to 40 minutes of low/moderate intensity aerobic exercise was practiced on the walking lane and 30 minutes of resistance exercises with emphasis on the large muscle groups and, in the end, muscle relaxations and general articulations.

2.4 COMBINED TRAINING WITH NUTRITIONAL MONITORING

Performed three times a week for a period of 15 weeks, with each session consisting of initial dynamic stretching, 30 minutes of low/moderate intensity aerobic exercise on a walking lane, 30 minutes of resisted exercise, prioritizing large muscle groups and final relaxation. CTrN offered individualized nutritional monitoring and body circumference measurements at biweekly meetings.

2.5 STRENGHT TRAINING

Sessions performed three times a week for approximately 60 min and over the 15-week period. STr was composed of three sets of 10 repetitions in each bodybuilding apparatus, respecting the interval of 60 and 90 seconds between sets and exercises, respectively. The training intensity was set at 70% of a maximal repetition (1MR) in each exercise. The following exercises were part of the training routine: chest flier, high pull, triceps thread, biceps thread, lateral flight, leg press, knee extensor, knee flexor, plantar flexion and abductor chair. At the beginning of each session, the elongation was guided collectively and, at the end of the session, performed individually.

2.6 AEROBIC INTERVAL TRAINING

Treadmill treadmill exercise performed three times a week over a 12-week period following a treadmill treadmill protocol of Hight Intensity Interval Training (HIIT) with individualized training intensity and cycles of 4:3 minutes at 70:90 % of maximum heart rate (HRmax). The sessions started with a 10-minute warm-up on the ergometer and at the end, five minutes to reduce the heart rate, controlling the heart rate of the subjects with the aid of frequency meters.

2.7 FUNCTIONAL TRAINING

The FTr program sessions were performed three times a week, lasting one hour, for 12 weeks. The exercises were performed in the form of a circuit and following the following structure: general heating, with the activation of the core, using dynamic stretches for neuromuscular heating; functional exercises, prioritizing muscular preparation with pulling, pushing exercises, knee dominance, hip dominance, displacements with changes of direction, stabilization, flexion and extension of the core, up and down and proprioception; stretching, aiming at regeneration passively and through relaxation.

The application of the intervention protocols, despite their particularities, followed the recommendations for adults of the AHA and ACSM,[16] beginning with the adaptation sessions for a period of 15 days, with the purpose of familiarizing them with exercises and neuromuscular adjustments.

2.8 EVALUATIONS

Anthropometric: Body Mass Index (BMI) was calculated after stature collection (m) with a portable Cardiomed® stadiometer and total body weight (kg) with a Plenna® digital scale. The WC measurement was obtained with the use of a Sanny® metal tape that surrounded the smallest trunk measurement.[17]

Hemodynamic and functional: BP verification was performed using an Omron® automatic blood pressure monitor. The maximal oxygen consumption (VO_{2max}) was obtained through a submaximal ergospirometric test on a treadmill, following the recommendations of the Bruce protocol, modified by Shefield.[18] During the ergospirometric test, a VO2000® gas analyzer was used, where she was connected to the device using a mouthpiece and nasal clip. The RH of resting was measured in the resting phase with a duration of five minutes, at the end of each minute of the test stages, lasting three minutes each, and in the recovery phase that lasts for five minutes using a frequency meter Accurex Plus-Polar®.[19]

Biochemical: Blood samples were collected by clinical laboratory, with fasting individuals of 12 hours and without intense physical exercise for 48 hours before collection to verify the levels of GLU, Total Cholesterol (TC) and their fractions, Low Density Lipoprotein (LDL-c), HDL-c and TG.

2.9 STATISTICAL ANALYSIS

The descriptive statistics of the results are presented as mean value and standard deviation of the mean (X±S). The normality of the data was verified through the Shapiro-Wilk test. The paired Student's t-test or Wilcoxon test was used in the pre and post intervention comparison, according to the distribution of the data. The Statistical Package for the Social Sciences (SPSS®, Chicago, USA) version 20.0 was adopted and a significance level of 5% was adopted.

3 RESULTS

The comparison between the different training methods applied in the MetS showed that the AITr positively modified the largest number of variables, followed by the TNr (four and three, respectively). The STr, CTr and FTr methods were not as efficient for most of the MetS risk factors.

Among the analyzed variables, the WC was the only one that presented decrease in all the training methods tested, however, the reduction was only significant in the IATr ($p<0.05$). Among the functional variables, the maximum oxygen consumption increased in the STr, AITr and FTr groups. In the hemodynamic evaluations, SBP presented reduction in CTr and in CTrN, the same did not occur for BPD that reduced only in the CTrN. In the biochemistry, HDL-c improved in the CTrN and STr, and the GLU in the AITr (Central Figure).

The complete anthropometric, functional, hemodynamic and biochemical data, collected before and after intervention, in the different training methods are shown in table 2.

Table 2 - Comparison of the variables of individuals with Metabolic Syndrome submitted to different interventions.

Variable (units)	Combined Training		Combined Training + Nutrition		Strenght Training		Aerobic Interval Training		Functional Training	
	Before (n=12)	After (n=12)	Before (n=12)	After (n=12)	Before (n=10)	After (n=10)	Before (n=18)	After (n=18)	Before (n=17)	After (n=17)
Body Weight (kg)	87,5±22,4	87,9±23,8	91,4±20,8	91,6±20,8	85,4±8,5	84,7±8,2	77,9±14,5	76,9±14,7*	84,2±11,3	84,2±11,2
Body Mass Index (kg/m^2)	34,6±7,7	34,7±8,3	34,3±6,8	34,2±7,1	-	-	-	-	33,0±3,6	33,3±3,9
Waist Circumference (cm)	100,9±19,8	99,6±21,7	102,9±16,2	100,5±16,3	96,6±11,7	94,6±12,2	91,0±9,9	89,3±9,9*	103,5±10,3	102,5±10,6
Oxygen Uptake (ml/kg/min)	-	-	-	-	23,4±8,5	29±6,7*	31,8±7,2	35,3±8,7*	20,5±4,9	44,9±11,0*
Systolic Blood Pressure (mmHg)	132±8,4	126,0±13,4*	141,9±20,6	125,4±17,8*	163,7±11,6	171,1±48,3	118,9±16,5	126,2±12,0	133,9±14,3	123,6±16,9
Diastolic Blood Pressure (mmHg)	90,0±7,0	78,0±4,5	92,3±12,1	78,3±7,5*	107,7±85,7	85,0±36,3	72,0±8,4	76,5±5,9*	87,1±8,9	80,9±10,3
Resting Heart Rate (bpm)	-	-	-	-	-	-	73,7±9,2	69,8±7,2	70,8±10,5	73,2±8,7
Total Cholesterol (mg/dL)	214,8±30,3	239,2±44,9	238,6±64,0	224,2±35,9	-	-	203,8±61,5	205,4±81,7	210,2±40,6	216,1±39,0
Triglycerides (mg/dL)	154,4±66,1	174,0±72,6	223,4±150,0	204,5±105,6	-	-	133,7±67,1	140,2±81,7	163,4±78,4	175,9±93,9
HDL-c (mg/dL)	60,2±23,3	61,4±19,7	46,8±7,6	53,7±11,2*	39,8±11,6	48,6±7,9**	49,7±18,7	42,0±11,6*	85,8±15,4	67,2±22,4
LDL-c (mg/dL)	-	-	-	-	102,4±39,3	105,5±49,7	127,4±54,5	135,4±36,3	91,7±36,6	113,8±32,1
Glucose (mg/dL)	110,2±36,8	114,2±33,8	110,5±52,6	107,8±31,5	93,0±27,5	96,7±23,7	98,7±22,6	85,1±25,3*	113,4±27,1	124,2±37,9

Legend: values presented in mean and standard deviation (X±S); *p<0,05; **p<0,01 (between pre and post intervention). Empty cells correspond to uncollected data.

4 DISCUSSIONS

This work has been developed a decade ago by the Physical Activity and Health Lab at Federal University of Santa Maria, in the southern region of Brazil. The group of researchers evidences in the results over this time that MetS has several complicators that interfere in its treatment, mainly in the non-drug part, which involves the eating habits and the practice of physical exercises, fundamental for the control and decrease of the MetS risk factors. Studies report that there are several benefits of physical exercise, and among the main ones are the reduction of MetS[20] and other risk factors of the syndrome and for CVD, such as dyslipidemia,[21] hypertension,[21] diabetes mellitus[22] and obesity.[21,23-25]

Among the intervention protocols tested, AITr was responsible for the greatest number of beneficial changes in participants, significantly reducing total body weight, WC and GLU and increasing VO_{2max}. However, the training method showed unexpected effects such as increased Systolic Blood Pressure (SBP) and decreased HDL-c. WC is an important anthropometric measurement because it is related to the amount of visceral fat, body weight and GLU intolerance. Thus, as a reduction of the last two variables was observed, this may have also led to a decrease in visceral fat.

Corroborating with the findings of this study, Ismail et al.,[26] confirmed in a meta-analysis that aerobic exercise was more effective for WC reduction when compared to other types of training, such as resistance training. But although total body mass loss is important to reduce obesity, isolated aerobic exercise can lead to decreased muscle mass,[27] which is not interesting for healthy aging.

Although it was verified a significant reduction of WC only in the AITr, it is necessary to emphasize that all the applied trainings promoted positive alterations for this measure, being possible to infer that the amount of fat of the abdominal region decreased. The accumulation of abdominal fat is responsible for the increase in the circumference of the trunk and is associated with the aging process, as observed in the study by Saad et al.,[3] carried out with 243 elderly people from a city on the coast of Brazil. In the meta-analysis of cohort studies, which included 58.609 elderly, it was concluded that abdominal circumferences greater than 102 cm in men and greater than 88 cm in women were consistently associated with all-cause mortality and CVD in individuals overweight and obese, and even those classified as eutrophic for the BMI categories.[28]

In this sense, the importance of the reduction of the anthropometric variables and consequent decrease of the adipose tissue, evidenced in this study, as the most important modification to contain the advance or avoid the MetS is highlighted. The review of Kaur[14] presents the hierarchy in the installation of the risk factors present in the MetS, hyperplasia and hypertrophy of adipose tissue, the first serious consequence that can be installed in the individual, influenced by inappropriate behaviors (eg, not carrying out physical activity, smoking, eating high-calorie foods and staying under stress) and aggravated by the genetic component.

The pathophysiology of abdominal obesity is sensitive to positive energy balance dynamics, providing rapid response to the number and size of adipocytes.[29] The increase in adipose tissue leads to overproduction of adipocytokines, biologically active metabolites, which include pro-inflammatory mediators,[30] leading initially to localized inflammation that progresses to systemic inflammation and is associated with cardiovascular complications related to obesity.[31]

The hemodynamic behavior in the different training methods was diffuse. The best blood pressure responses were obtained in the combined training sessions (with and without nutritional monitoring), where differences were found between pre and post training. When nutritional monitoring was associated with the combined physical exercise, both SBP and BPD responded positively, reducing their levels. CTr promoted changes modifying only SBP and FTr, although it did not present significant results, it decreased both (SBP and DBP). In AITr, BPD increased significantly after the training period, which was not expected. One possible explanation for the results found in this study may be the fact that only the training that associated physical exercise with dietary monitoring (CTrN) presented an adequate blood pressure response that is, modifying both SBP and BPD. Thus, it is evident that BP reduction in patients with multiple risk factors, as in the case of MetS, requires a combination of lower sodium intake and regular physical exercise.

In the complex mechanism of development of MetS, the resistance to the action of the insulin, caused by the increase of the adipose tissue, directly interferes in the pressure levels of the individuals. The literature describes protective and deleterious effects of insulin on the cardiovascular system. In relation to deleterious vascular effects, hyperinsulinism leads to vasoconstriction, increased proinflammatory activity,[32] and reabsorption of sodium and water by the kidney,[33] which elevates blood pressure.[34,35] The increase in water retention is a mechanism reactive activation of the sympathetic nervous system and the renin-angiotensin-aldosterone system (RAAS) in response to proinflammatory activity.[36] In addition, adipocytes have also been shown to stimulate the production and release of aldosterone through the adrenal cortex, representing another pathophysiological link between adiposity and hypertension.[37,38]

The biochemical evaluation of the TC and its fractions (TG, HDL-c and LDL-c) presented differences only for HDL-c in CTrN, STr and AITr, increasing in the first two and unexpectedly decreased in the latter. The GLU responded only to the AITr. In the study by Hansel et al.,[39] the authors confirm the protective effect of HDL-c for patients with MetS and emphasize that the application of a lifestyle program, with reduction of caloric intake associated with increased physical activity, like CTrN performed by this study, improves the function of HDL-c. The increase in HDL-c concentration is only achieved by long-term aerobic exercise and high caloric expenditure.[40] However, in this study, gains were also seen in the CTrN and STr, showing that the dissociation between the quantitative and

quality of HDL-c, reinforce the idea that in addition to plasma levels of lipoprotein the quality of the lipoprotein should be considered.[41]

The evaluation of VO_{2max} demonstrated that cardiorespiratory adaptations were significant after training periods in STr, AITr and FTr. The maximum oxygen uptake in CTr and CTrN was estimated by a method different from that applied in the previously mentioned groups, and for this reason the data were not presented. Individuals with MetS often have low aerobic capacity, which makes physical training an essential component in the treatment of the syndrome. High-intensity interval training interventions modify the metabolic profile and cardiovascular fitness, supported by the action of the skeletal muscles,[42] which reinforces the findings of this study.

5 CONCLUSIONS

The main outcome of the study reflects that which has been considered as the precursor of all other risk factors in MetS, i.e., waist circumference. It was verified the capacity that the AITr presented in the reduction of the anthropometric measurements of body weight and WC and the biochemical variable of GLU. This important modification is directly related to the improvement of insulin sensitivity, blood pressure levels and lipid profile.

MetS challenges researchers in describing and clarifying all aspects of the syndrome, as well as on the approach strategies for treating multiple risk factors present in the individual. The difficult control of all variables is a reality; however, it is emphasized that even small changes, often not significant when analyzed in the large group, represent individual benefits that modify the general status of the disease. The fact that MetS risk factors do not increase in number and in the intensity of the metabolic disorder can be considered as a positive point in the control and combat of this pathology.

Among the limitations of the study are the non-presentation of data that were collected with different methodologies of some variables. The intervention time is also highlighted, although the largest training gains are expected to occur up to 8 weeks and the size of the group evaluated in each type of intervention.

REFERENCES

1. Alberti KG, Eckel RH, Grundy SM, Zimmet PZ, Cleeman JI, Donato KA, et al. Harmonizing the metabolic syndrome: a joint interim statement of the international diabetes federation task force on epidemiology and prevention; national heart, lung, and blood institute; American heart association; world heart federation; international atherosclerosis society; and international association for the study of obesity. *Circulation*. 2009;120(16):1640-1645.

2. Olevate I, Pinto M, Baraúna M, Rocha L. Síndrome metabólica: aspectos clínicos e tratamento. *Rev Bras Fis Esp*. 2011;10(1):53-60.

3. Saad MAN, Cardoso GP, Martins WA, Velarde LGC, Cruz Filho RA. Prevalência de síndrome metabólica em idosos e concordância entre quatro critérios diagnósticos. *Arq Bras Cardiol*. 2014;102(3):263-269.

4. Freitas ED de Haddad JPA, Velásquez-Meléndez G. Uma exploração multidimensional dos componentes da síndrome metabólica. *Cad Saúde Pública.* 2009; 25:1073-1082.

5. Marquezine GF, Oliveira CM, Pereira AC, Krieger JE, Mill JG. Metabolic syndrome determinants in an urban population from Brazil: social class and gender-specific interaction. *Int J Cardiol*. 2008;129(2):259-265.

6. Salaroli LB, Molina MC, Mill JG, Barbosa GC. Prevalência de síndrome metabólica em estudo de base populacional, Vitória, ES-Brasil. *Arq Bras Endocrinol Metabol*. 2007:1143-

7. Nakazone MA, Pinheiro A, Braile MCVB, Pinhel MADS, Sousa GFD, Pinheiro Júnior S, et al. Prevalência de síndrome metabólica em indivíduos brasileiros pelos critérios de NCEP-ATPIII e IDF. *Rev Assoc Med Bras*. 2007;53(5):407-413.

8. Marcondes JAM, Hayashida SA, Barcellos CR, Rocha MP, Maciel GA, Baracat EC. Metabolic syndrome in women with polycystic ovary syndrome: prevalence, characteristics and predictors. *Arq Bras Endocrinol Metabol*. 2007;51(6):972-979.

9. Miccoli R, Bianchi C, Odoguardi L, Penno G, Caricato F, Giovannitti MG, et al. Prevalence of the metabolic syndrome among Italian adults according to ATP III definition. *Nutr Metab Cardiovasc Dis.* 2005;15(4):250-254.

10. Hu G, Qiao Q, Tuomilehto J, Balkau B, Borch-Johnsen K, Pyorala K. Prevalence of the metabolic syndrome and its relation to all-cause and cardiovascular mortality in nondiabetic European men and women. *AMA Arch Intern Med*. 2004;164(10):1066-1076.

11. Park Y-W, Zhu S, Palaniappan L, Heshka S, Carnethon MR, Heymsfield SB. The metabolic syndrome: prevalence and associated risk factor findings in the US population from the Third National Health and Nutrition Examination Survey, 1988-1994. *AMA Arch Intern Med*. 2003;163(4):427-436.

12. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults: findings from the third National Health and Nutrition Examination Survey. *JAMA*. 2002;287(3):356-359.

13. Steemburgo T, Moraes F, Dall'Alba V, Almeida JCD, Silva FM, Zelmanovitz T, et al. Intake of fibers from fruits and whole grains has a protective role for the presence of metabolic syndrome in patients with type 2 diabetes. *Rev HCPA, RS*. 2006.

14. Kaur J. A comprehensive review on metabolic syndrome. *Cardiol Res Pract.* 2014;2014.

15. I Diretriz Brasileira de Diagnóstico e Tratamento da Síndrome Metabólica. *Arq Bras Cardiol.* 2005;84(Suplemento I).

16. Haskell WL, Lee IM, Pate RR, Powell KE, Blair SN, Franklin BA, et al. Physical activity and public health: updated recommendation for adults from the American College of Sports Medicine and the American Heart Association. *Circulation*. 2007;116(9):1081.

17. Pitanga FJG. *Testes, Medidas e Avaliação em Educação Física e nos Esportes.* 4th ed. São Paulo:Phorte; 2005.

18. Sheffield LT, Maloof JA, Sawyer JA, Roitman D. Maximal heart rate and treadmill performance of healthy women in relation to age. *Circulation*. 1978;57(1):79-84.

19. Balady GJ, Berra KA, Golding LA, Gordon NF, Mahler DA, Myers JN, et al. *Diretrizes do ACSM para os testes de esforço e sua prescrição*. Rio de Janeiro:Guanabara. 2003;239.

20. Gaesser GA. Exercise for prevention and treatment of cardiovascular disease, type 2 diabetes, and metabolic syndrome. *Curr Diab Rep*. 2007;7(1):14-19.

21. Schjerve IE, Tyldum GA, Tjønna AE, Stølen T, Loennechen JP, Hansen HE, et al. Both aerobic endurance and strength training programmes improve cardiovascular health in obese adults. *Clin Sci*. 2008;115(9):283-293.

22. LaMonte MJ, Blair SN, Church TS. Physical activity and diabetes prevention. *J Appl Physiol.* 2005;99(3):1205-1213.

23. Ross R, Dagnone D, Jones PJ, Smith H, Paddags A, Hudson R, et al. Reduction in obesity and related comorbid conditions after diet-induced weight loss or exercise-induced weight loss in men: a randomized, controlled trial. *Ann Intern Med*. 2000;133(2):92-103.

24. Swift DL, Johannsen NM, Lavie CJ, Earnest CP, Church TS. The role of exercise and physical activity in weight loss and maintenance. *Prog Cardiovasc Dis*. 2014;56(4):441-447.

25. Ades PA, Savage PD. Potential benefits of weight loss in coronary heart disease. *Prog Cardiovasc Dis*. 2014;56(4):448-456.

26. Ismail I, Keating S, Baker M, Johnson N. A systematic review and meta-analysis of the effect of aerobic vs. resistance exercise training on visceral fat. *Obes Rev*. 2012;13(1):68-91.

27. Mekary RA, Grøntved A, Despres JP, De Moura LP, Asgarzadeh M, Willett WC, et al. Weight training, aerobic physical activities, and long-term waist circumference change in men. *Obesity*. 2015;23(2):461-467.

28. de Hollander EL, Bemelmans WJ, Boshuizen HC, Friedrich N, Wallaschofski H, Guallar-Castillón P, et al. The association between waist circumference and risk of mortality considering body

mass index in 65-to 74-year-olds: a meta-analysis of 29 cohorts involving more than 58 000 elderly persons. *Int J Epidemiol*. 2012;41(3):805-817.

29. Halberg N, Wernstedt-Asterholm I, Scherer PE. The adipocyte as an endocrine cell. *Endocrinol Metab Clin North Am*. 2008;37(3):753-768.

30. Lau DC, Dhillon B, Yan H, Szmitko PE, Verma S. Adipokines: molecular links between obesity and atheroslcerosis. *Am J Physiol Heart Circ.* 2005;288(5):H2031-H2041.

31. Trayhurn P, Wood IS. Adipokines: inflammation and the pleiotropic role of white adipose tissue. *Br J Nutr*. 2004;92(3):347-355.

32. Schulman IH, Zhou M-S. Vascular insulin resistance: a potential link between cardiovascular and metabolic diseases. *Curr Hypertens Rep*. 2009;11(1):48-55.

33. Horita S, Seki G, Yamada H, Suzuki M, Koike K, Fujita T. Insulin resistance, obesity, hypertension, and renal sodium transport. *Int J Hypertens.* 2011;2011.

34. Muniyappa R, Montagnani M, Koh KK, Quon MJ. Cardiovascular actions of insulin. *Endocr Rev*. 2007;28(5):463-491.

35. Zhou M-S, Schulman IH, Raij L. Vascular inflammation, insulin resistance, and endothelial dysfunction in salt-sensitive hypertension: role of nuclear factor kappa B activation. *J Hypertens*. 2010;28(3):527-535.

36. Straub RH. Evolutionary medicine and chronic inflammatory state—known and new concepts in pathophysiology. *J Mol Med*. 2012;90(5):523-534.

37. Ehrhart-Bornstein M, Lamounier-Zepter V, Schraven A, Langenbach J, Willenberg HS, Barthel A, et al. Human adipocytes secrete mineralocorticoid-releasing factors. *Proc. Natl. Acad. Sci.* 2003;100(24):14211-14216.

38. Briones AM, Nguyen Dinh Cat A, Callera GE, Yogi A, Burger D, He Y, et al. Adipocytes produce aldosterone through calcineurin-dependent signaling pathways: implications in diabetes mellitus–associated obesity and vascular dysfunction. *Hypertension*. 2012: HYPERTENSIONAHA-111.

39. Hansel B, Bonnefont-Rousselot D, Orsoni A, Bittar R, Giral P, Roussel R, et al. Lifestyle intervention enhances high-density lipoprotein function among patients with metabolic syndrome only at normal low-density lipoprotein cholesterol plasma levels. *J Clin Lipidol*. 2016;10(5):1172-1181.

40. Casella-Filho A, Chagas ACP, Maranhão RC, Trombetta IC, Cesena FH, Silva VM, et al. Effect of exercise training on plasma levels and functional properties of high-density lipoprotein cholesterol in the metabolic syndrome. *Am. J. Cardiol.* 2011;107(8):1168-1172.

41. Casella-Filho A, Casella L, Dourado P, Dourado L, Roever L. Dissociation between Quantitative and Qualitative Aspects of HDL Evidenced by Aerobic Exercise in Metabolic Syndrome. *Atheroscler.* 2:109. *of*. 2017; 4:2.

42. Guadalupe-Grau A, Fernández-Elías V, Ortega JF, Dela F, Helge J, Mora-Rodriguez R. Effects of 6-month aerobic interval training on skeletal muscle metabolism in middle-aged metabolic syndrome patients. *Scand J Med Sci Sports*. 2018;28(2):585-595

SEVEN publicações acadêmicas

National policy for cancer prevention and control: A discussion on the prevention and control of breast cancer

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ABSTRACT
Introduction: Characterized by the disordered growth of cells, cancer is a group of more than 100 diseases, of which breast cancer stands out. It consists of a malignant neoplasm with disordered and uncontrollable multiplication of abnormal cells, which is considered to be heterogeneous with histopathological variations and generally originates from epithelial tissue. Many breast carcinomas have been described in the literature, with ductal carcinoma in situ and invasive ductal carcinoma being the most common. In addition, the International Agency for Research on Cancer (IARC) has pointed out that this is the second most incident type of cancer and the fifth leading cause of death compared to all cancers diagnosed in the world, thus making it a priority in the National Health Policy. Aim: To investigate and detail the National Policy for the Prevention and Control of Breast Cancer. Considerations: In Brazil, there are many policies for the prevention and control of breast cancer, but there is a need to intensify the implementation of actions and strategies for its early detection, with the aim of reducing the mortality rate and disability of patients diagnosed with breast cancer. It is therefore essential to execute and implement prevention and control policies so that they are effective in preventing new cases and reducing mortality from this disease.

Keywords: Public Policy, Breast cancer, Health System.

1 INTRODUCTION

Coming from the Greek *karkínos*, the word cancer was first used by Hippocrates (460 and 377 BC), so that, today, it refers to a disease that affects the population for more than 3,000 years before Christ. Under this bias, this is characterized by a set of more than 100 derived pathologies and represents a disordered growth of cells, which are able to enter neighboring tissues and organs (INCA 2020). In addition, due to its power to compromise life expectancy and be one of the leading causes of early death before the age of 70, cancer is considered a worldwide public health problem (INCA, 2023).

In this context, data from INCA (2022) with an estimate for the triennium from 2023 to 2025 in Brazil indicate that there will be 704,000 new cases of cancer, 483,000 if cases of non-melanoma

skin cancer are excluded. This is estimated as the most incident, with 220,000 new cases (31.3%), followed by breast cancers, with 74,000 (10.5%); prostate, with 72 thousand (10.2%); colon and rectum, with 46 thousand (6.5%); cervix, with 17 thousand (4.7%); lung, with 32 thousand (4.6%); thyroid, with 14 thousand (3.9%); oral cavity, with 11 thousand (3.2%) and stomach, with 21 thousand (3.1%) new cases.

It is also noteworthy that the incidence and mortality of cancer has increased worldwide. According to data from the Pan American Health Organization, cancer was responsible for 9.6 million deaths worldwide (PAHO, 2020). The reasons for this are diverse, such as population aging, population increase and changes in exposure to risk factors, which are often related to the socioeconomic development of a particular region or country (BRAY *et al.*, 2018). In addition, there is a prospect that cancer will become the world leader in death from diseases, mainly by decreasing deaths from heart disease and stroke (BRAY *et al*., 2018).

Similarly, according to Sung *et al.* (2021), the latest global estimates of incidence and mortality related to cancer point to the need to adopt sustainable measures for cancer prevention and control, so that Ferlay *et al.* (2021) state that these strategies should be aimed at strengthening public policies that support the planning and prioritization of measures to control this disease.

Given this, to understand the advancement of the health system in relation to cancer, it is worth a brief historical consideration about the disease. In the 1920s the first oncological treatment services appeared, and in 1922, in Belo Horizonte, the Radium Institute was inaugurated, which worked in association with the Faculty of Medicine of the State of Minas Gerais, as well as in 1929, within the scope of the Santa Casa de Misericórdia de São Paulo, the Dr. Arnaldo Institute came into operation, philanthropic institution directed to the treatment of cancer. After that, in 1937 there was the creation of the Oncology Center of the Federal District, by the doctor Mario Kroeff, who was one of the pioneers in the oncology area in Brazil (TEIXEIRA; HARBOR; HABIB, 2012).

Thus, it is pointed out that, although there was already concern of the medical classes on this subject, with the organization of the first Brazilian congresses on cancer, in a country where the reality of the majority of the productive population was struggling with health problems, the discussion of problems related to the aging of the body had not yet gained strength (ARAÚJO NETO; TEIXEIRA, 2017).

It was only from the 1940s, during the government of President Getúlio Vargas, that the structuring of public health services was initiated, so that in 1941 the National Cancer Service (SNC) was created, currently known as the José de Alencar Gomes da Silva National Cancer Institute – INCA (TEIXEIRA, 2010). According to Teixeira *et al.* (2010), the SNC emerged from the intense work of the gaucho physician Mario Kroeff who, due to his proximity to power during the getulista government,

managed to work on the awareness of the political and economic elites about the epidemiological importance of the disease and the need for its control.

Thus, the National Cancer Service was responsible for guiding and controlling, throughout the country, a permanent campaign against the disease, the National Campaign Against Cancer. Its work would have as axes the research on etiology, epidemiology, prophylaxis, diagnosis and therapeutics; preventive actions; the propaganda of periodic health examinations and the importance of early diagnosis; the treatment and supervision of the recovered; and the hospitalization of patients when needed (TEIXEIRA, 2010).

The SNC was small in the early years, but progressively it was incorporated into several philanthropic hospitals, units maintained by state governments and civil entities to support the creation of new institutions. This set would later compose a network called the National Campaign to Combat Cancer (TEIXEIRA; HARBOR; HABIB, 2012).

In 1944, the structure and functioning of the SNC became more defined and began to be composed of three sections, an exclusive administrative section, one focused on the Cancer Institute and the Organization and Control Section. The first was the Center created by Kroeff, which in the future would become the National Cancer Institute (INCA) and which, although it continued to carry out diagnostic and treatment activities, had its action limited by the extreme deficiency of physical facilities. In turn, the Organization and Control Section would be responsible for the National Campaign Against Cancer (CNCC), acting at the national level in standardizing the activities of public and private institutions. It would also provide advice to the Ministry of Health (MS) in relation to the federal subsidy to private institutions (TEIXEIRA, 2010).

The inauguration of the new headquarters of INCA, in 1957, with many trained professionals and with increased funding, was a milestone for the cancer area in Brazil (TEIXEIRA, 2010). However, only after the promulgation of the constitution in 1988 were there changes in the Brazilian sanitary structure. In the new constitution, the principles of universality, equity and integrality in health actions were assured (BRASIL, 1988).

In short, in Brazil, public policies, regulations and norms, actions and programs to control and combat cancer are just over 25 years old. In this period, a cancer care policy was structured that contains a large volume of norms that hinder the knowledge of managers and health professionals. On the other hand, this succession of norms indicates a prominent place in the political agenda, in line with the epidemiological importance of cancer (SILVA *et al*., 2017).

Among them, there is the National Policy for the Prevention of Cancer Control (PNPCC), Ordinance No. 874/13, as a Legal Framework. In addition to the central issues related to the line of care, contemplated in previous legislation, the PNPCC gives greater emphasis to the integrality of health care and information. Its guidelines highlight the need for planning, monitoring and evaluation

of actions and services for the prevention and control of cancer through the integrated use of data and epidemiological and care information available (BRASIL, 2013).

In the current conjuncture, specifically on October 16, 2019, the Federal Senate approved House Bill No. 143 of 2018, known as the 30-day PLC, which establishes that, in cases where the main diagnostic hypothesis is that of malignant neoplasm, the examinations necessary for the elucidation of the case must be carried out within a maximum period of 30 days, upon reasoned request of the physician in charge. PLC No. 143 was sanctioned by the President of the Republic and published in the official gazette as Law No. 13,896 of October 30, 2019 (BRAZIL, 2019b).

Still from this perspective, it is exposed that from the creation of the Unified Health System (SUS) it was possible to implement a new set of policies in order to structure the care to the cancer patient in several fronts of organization (SILVA *et al*., 2017). The first of these, Ordinance No. 170/93, classified the oncological treatment units in Reference Center (CR) I and II according to complexity (BRASIL, 1993). Subsequently, Ordinance No. 3,535/98, which repealed Ordinance No. 170/93, established new criteria for the registration of High Complexity Reference Centers in Oncology (CACON), which could be classified into three categories: CACON I, CACON II and CACON III (BRASIL, 1998).

Similarly, Ordinance No. 741/05, referring to the organization of the Oncological Care Networks (RAO), established the mandatory implementation of the Hospital Cancer Registry (RHC) in all Cancer Treatment Centers of the SUS, creating an epidemiological database essential for future planning of strategies to combat cancer. The RHC has the responsibility of registering all new cases in a database, which is annually sent to INCA for compilation and publication of data (BRASIL, 2005b).

In 2012, with the concern of the difficulty of access to treatments, Law No. 12,732 was published, one of the most important regarding public policies in oncology. This law became popularly known as the "Law of 60 days" (BRAZIL, 2012a). This law establishes that the first oncological treatment by SUS must start within a maximum period of 60 days from the signature of the anatomopathological report or in a shorter period (BRASIL, 2012a).

Given this scenario, actions developed by the State, through health programs and public policies, are essential for the combat, early diagnosis and control of this disease. In December 2005, with Ordinance No. 2,439 of the Ministry of Health (MS), neoplasms were classified as a public health problem and the bases of a broad National Policy of Oncological Care were established, whose main objectives would be: to promote the quality of life and health of society; organize lines of care that involved all levels of care (basic and specialized, of medium and high complexity) and care (promotion, prevention, diagnosis, treatment, rehabilitation and palliative care); and to establish hierarchical and organized networks, guaranteeing access and comprehensive care (BRASIL, 2005a).

Also noteworthy is Law No. 14,238, of November 19, 2021, which established the statute of the person with cancer, aimed at ensuring and promoting, under conditions of equality, access to appropriate treatment and the exercise of the rights and fundamental freedoms of the person with cancer. "Single paragraph. This Law establishes principles and objectives essential to the protection of the rights of the person with cancer and the implementation of policies to prevent and combat cancer." (Brasil, 2021).

In summary, in view of the contextualization made, the present study focuses on breast cancer, which is defined as a malignant neoplasm, characterized by the multiplication of abnormal cells, in a disordered and uncontrollable way, being a heterogeneous disease with histopathological variations, and usually coming from the epithelial tissue. Many breast carcinomas are described in the literature, the most common being: ductal carcinoma in situ, invasive ductal carcinoma (triple negative and inflammatory), the least incident breast cancers are these: Paget's disease, angiosarcoma and phylloid tumor. (AMERICAN CANCER SOCIETY, 2015; RIVENBARK; O'CONNOR; COLEMAN, 2013).

The International Agency for Research on Cancer (IARC) pointed out that this is the second most common type of cancer and the fifth cause of death compared to all cancers diagnosed in the world. In addition, there is a growing increase in the number of new cases, both in developed and developing countries (FERLAY *et al*., 2015).

Thus, this disease becomes a priority in the National Health Policy. The Guidelines for the Early Detection of Breast Cancer in Brazil launched in 2015 emphasize that breast cancer control remains one of the priorities in the agenda of health care for Brazilian women. For the control of this cancer, the Ministry of Health has recommended the performance of mammography in order to focus on its early detection, through early diagnosis and screening, due to the great magnitude of this disease (INCA, 2015a).

Regarding the development of this disease, there are several risk factors correlated with it. Some of these factors can be partially changed and there are those that cannot be changed. They are: a) non-alterable (hereditary factors that characterize family history, histological characteristics of cancer, staging, ethnicity and age); b) those partially alterable (related to the sexual and reproductive life of the woman, such as early menarche, late menopause, absence of pregnancy or late pregnancy, absence of breastfeeding, the use of contraceptives and hormone replacement); and c) the alterable ones (excessive intake of alcoholic beverages, tobacco use, sedentary lifestyle, type of diet causing an increase in total and abdominal body fat) (RIVENBARK; O'CONNOR; COLEMAN, 2013.

Socioeconomic and demographic conditions, the difficulty of access to the screening test, late diagnosis, late or inadequate treatment, the process of urbanization, industrialization and the new lifestyle of the population are also considered as contributors to the development of breast cancer (DESANTIS *et al*., 2015; MORALES *et al*., 2013; TEIXEIRA; HARBOR; HABIB, 2012).

Usually, breast cancer is detected early by a screening test or detected late by the presence of a lump in the breast. Most cell masses or nodules seen on a mammogram are benign. When malignancy is suspected, microscopic analysis of breast tissue by means of a needle or surgical biopsy is required (INCA, 2015a).

Regarding the mortality rates of this disease, they are higher in developing countries, which may be related to a late detection of the disease and, consequently, to the delay in the start of treatment (CORBEX; BOUZBID; BOFFETTA, 2014).

In the social aspect, women diagnosed with breast cancer undergo changes in their family and work routine. They may have to abandon or reduce their work activities as a result of treatment and/or mastectomy. These routine changes end up providing financial limitations in the family, and when this woman is the provider of family income, the situation becomes even more difficult, since it compromises her livelihood and that of her dependents. Sometimes these women experience physical pain and weakness, which can make household chores difficult. When it is necessary to remove the breast, the suffering intensifies both from the biological and psychological point of view, and may have a reflection on aspects of femininity, sexual libido and contribute to low self-esteem and depression (LAGO *et al*., 2015; GUIMARÃES; ANJOS, 2012).

Although breast cancer affects both men and women, this is a more significant incidence and mortality aggravation among women. Therefore, the projection of new cases of this cancer has a potential impact on their lives. There may be personal, family and social consequences that directly influence women's quality of life. Economic repercussions and in the management of health services can also lead to a decrease in the quality of health care for these patients. (ALMEIDA *et al*., 2016).

In addition, over the years, estimates suggest an increase in cancer cases overall, which may be associated with population growth and aging. For breast cancer, the situation is similar, because each year the number of women with this condition has also been increasing, suggesting that longevity among women may be a factor that contributes to the increase in the number of cases (ROSA; RADÜNZ, 2012).

In Brazil, the increase in the number of cases of breast cancer has been confirmed based on evidence from the official records of the Ministry of Health (MS) and scientific research (INCA, 2015a, 2013e; RIBEIRO, 2013). The high mortality rates, presented since the 80's, have been shown to be indicative of the importance of breast cancer as a public health problem and the necessary inclusion of this chronic non-communicable disease as a priority in the researchers' agenda. (INCA, 2015a; ZAPPONI; MELO, 2010).

Studies show that having breast cancer can result in suffering for women, for example, resulting in fear of dying, fear about the evolution and recurrence of the disease, possible repercussions on the

care of children, financial concerns, the need for access to health services, in addition to the adverse effects of treatments (ALMEIDA *et al*., 2016).

In addition, patients undergoing treatment for Breast Cancer present physical-functional complications, requiring that physical therapy care be performed early. This rehabilitation with the physiotherapist becomes paramount because it presents a set of therapeutic possibilities that can be used in all phases of cancer treatment (diagnosis, chemotherapy, radiotherapy, hormone therapy, post-surgical, recurrence of the disease and palliative care), contributing to the reduction of fatigue associated with cancer, improvement of the general condition and reduction of the risk of complications associated with surgery, as well as injuries (OLIVEIRA, 2015).

Although the treatment for this pathology has advanced and achieved a significant reduction in mortality rates, sequelae have affected approximately 90% of this population, with its complications and severity increased, which consequently causes impairments in functionality in the short and long term (INCA, 2010).

Moreover, in addition to the specific issue of the social cost of breast cancer related to the family and work sphere, the financial impact of the disease on the Unified Health System (SUS) can also be highlighted, considering the costs of diagnosis, treatment and follow-up of affected women. Studies show that hospitalizations, chemotherapy treatments and social security benefits of women with breast cancer significantly burden the State (SIQUEIRA *et al*., 2016)

Given this, breast cancer is considered a public health problem of extreme relevance, due to the high incidence and prevalence evidenced in statistics. In Brazil, there are many policies for the prevention and control of breast cancer, but there is a need to intensify the implementation of actions and strategies for early detection of breast cancer, with the objective of reducing the mortality rate and disability of patients diagnosed with breast cancer.

It is worth mentioning that most cases are not diagnosed in the early phase of the disease, which results in aggressive treatments, such as radical mastectomy, in which the patient may develop serious functional, psychological and social limitations, which culminates in withdrawal from the labor market or palliative care, in order to minimize her suffering. Therefore, it is essential to implement and implement breast cancer prevention and control policies, so that they are effective in preventing new cases and reducing mortality caused by breast cancer.

REFERENCES

ALMEIDA, N. G. *et al*. Aspectos que podem influenciar a qualidade de vida da mulher mastectomizada. Ciência, Cuidado e Saúde, Maringá, v. 15, n. 3, p. 452-459, set. 2016. Disponível em: <https://doi.org/10.4025/ciencuidsaude.v15i3.31526>. Acesso em: 21 jul. 2023.

ARAÚJO NETO, L. A.; TEIXEIRA, L. A. De doença da civilização a problema de saúde pública: câncer, sociedade e medicina brasileira no século XX. Boletim do Museu Paraense Emílio Goeldi - Ciências Naturais, Belém, v. 12, n. 1, p. 173-188, jan./abr. 2017. Disponível em: <https://doi.org/10.1590/1981.81222017000100010>. Acesso em: 21 jul. 2023.

BRASIL. Constituição (1988). Constituição da República Federativa do Brasil. Brasília, DF: Senado, 1988.

BRASIL. Lei nº 12732, de 22 de novembro de 2012. Dispõe sobre o primeiro tratamento de paciente com neoplasia maligna comprovada e estabelece prazo para seu início. Diário Oficial da União, Brasília, 2012a. Seção I, p. 1. Disponível em: <https://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12732.html>. Acesso em: 21 jul. 2023.

BRASIL. Lei nº 13.896, de 31 de outubro de 2019. Altera a Lei nº 12.732, de 22 de novembro de 2012, para que os exames relacionados ao diagnóstico de neoplasia maligna sejam realizados no prazo de 30 (trinta) dias, no caso em que especifica. Diário Oficial da União, Brasília, 2019b. Seção I, p. 1. Disponível em: <https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2019/lei/l13896.htm>. Acesso em: 21 jul. 2023.

BRASIL. Lei nº 14.238, de 19 de novembro de 2021. Institui o Estatuto da Pessoa com Câncer; e dá outras providências. Diário Oficial da União, Brasília, 2021. Seção 1, p. 2. Disponível em: < https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2021/lei/L14238.htm#:~:text=Art.,e%20%C3%A0%20sua%20inclus%C3%A3o%20social>. Acesso em: 21 jul. 2023.

BRASIL. Ministério da Saúde. Portaria MS/GM nº 2439, de 08 de dezembro de 2005. Institui a política nacional de atenção oncológica: promoção, prevenção, diagnóstico, tratamento, reabilitação e cuidados paliativos, a ser implantada em todas as unidades federadas, respeitadas as competências das três esferas de gestão. Diário Oficial da União, Brasília, 2005a. Seção I, p. 80. Disponível em: <https://bvsms.saude.gov.br/bvs/saudelegis/gm/2005/prt2439_08_12_2005.html>. Acesso em: 21 jul. 2023.

BRASIL. Ministério da Saúde. Portaria nº 741, de 19 de dezembro de 2005. Define as unidades de assistência de alta complexidade em oncologia, os Centros de Assistência de Alta Complexidade em Oncologia (CACON) e os Centros de Referência de Alta Complexidade em Oncologia e suas aptidões e qualidades. Diário Oficial da União, Brasília, 2005b. Seção I, p. 113. Disponível em: <https://bvsms.saude.gov.br/bvs/saudelegis/gm/2005/prt2439_08_12_2005.html>. Acesso em: 21 jul. 2023.

BRASIL. Ministério da Saúde. Portaria nº 874, de 16 de maio de 2013. Institui a Política Nacional para a Prevenção e Controle do Câncer na Rede de Atenção à Saúde das Pessoas com Doenças Crônicas no âmbito do Sistema Único de Saúde (SUS). Diário Oficial da União, Brasília, 2013. Seção I, p. 129. Disponível em: <https://bvsms.saude.gov.br/bvs/saudelegis/gm/2013/prt0874_16_05_2013.html>. Acesso em: 21 jul. 2023.

BRAY, F. *et al*. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: A Cancer Journal for Clinicians, Atlanta, v. 68, n. 6, p. 394-424, 2018. Disponível em: <https://doi.org/10.3322/caac.21492>. Acesso em: 21 jul. 2023.

DESANTIS, C. E. *et al*. International Variation in Female Breast Cancer Incidence and Mortality Rates. Cancer, Epidemiology, Biomarkers & Prevention, Filadélfia, v. 24, n. 10, p. 1495-1506, out. 2015. Disponível em: <https://doi.org/10.1158/1055-9965.epi-15-0535>. Acesso em: 10 mai. 2023

FERLAY, J. *et al*. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. International Journal of Cancer, Genebra, v. 136, n. 5, p. E359-E386, mar. 2015. Disponível em: <https://doi.org/10.1002/ijc.29210>. Acesso em: 21 jul. 2023

INSTITUTO NACIONAL DE CÂNCER. Atualização para técnicos em radioterapia. Rio de Janeiro: INCA, 2010. 100 p. Disponível em: <https://www.inca.gov.br/publicacoes/livros/atualizacao-para-tecnicos-em-radioterapia>. Acesso em: 21 jul. 2023.

INSTITUTO NACIONAL DE CÂNCER. Diretrizes para a detecção precoce do câncer de mama no Brasil. Rio de Janeiro: INCA, 2015a. 171 p. Disponível em: <https://www.inca.gov.br/publicacoes/livros/diretrizes-para-deteccao-precoce-do-cancer-de-mama-no-brasil>. Acesso em: 21 jul. 2023.

INSTITUTO NACIONAL DE CÂNCER. Estimativa 2023: incidência de câncer no Brasil. Rio de Janeiro: INCA, 2022. 162 p. Disponível em: <https://www.inca.gov.br/publicacoes/livros/estimativa-2023-incidencia-de-cancer-no-brasil>. Acesso em: 21 jul. 2023.

INSTITUTO NACIONAL DE CÂNCER. ABC do câncer: abordagens básicas para o controle do câncer. Rio de Janeiro: INCA, 2018. 114 p. Disponível em: <https://www.inca.gov.br/publicacoes/livros/abc-do-cancer-abordagens-basicas-para-o-controle-do-cancer>. Acesso em: 21 jul. 2023.

INSTITUTO NACIONAL DE CÂNCER. Estimativa 2020: Incidência de Câncer no Brasil. Rio de Janeiro: INCA, 2019. 122 p. Disponível em: <https://www.inca.gov.br/sites/ufu.sti.inca.local/files/media/document/estimativa-2020-incidencia-de-cancer-no-brasil.pdf>. Acesso em: 21 jul. 2023.

LAGO, E. A. *et al*. Sentimento de mulheres mastectomizadas acerca da autoimagem e alterações na vida diária. Ciência & Saúde, Porto Alegre, v. 8, n. 1, p. 15-18, abr. 2015. Disponível em: <https://doi.org/10.15448/1983-652X.2015.1.18648>. Acesso em: 21 jul. 2023.
.

MORALES, L. *et al*. Factors associated with Breast Cancer in Puerto Rican women. Journal of epidemiology and global health, Saudi Arabia, v. 3, n. 4, p. 205-2015, dez. 2013. Disponível em: <https://doi.org/10.1016/j.jegh.2013.08.003>. Acesso em: 21 jul. 2023.

OLIVEIRA, R. A.. Efeitos do treinamento aeróbio e de força em pessoas com câncer durante a fase de tratamento quimioterápico. Revista Brasileira de Prescrição e Fisiologia do Exercício, São Paulo, v. 9, n. 56, p. 662-70, 2015. Disponível em: <https://doi.org/10.1016/j.jegh.2013.08.003>. Acesso em: 21 jul. 2023.

ORGANIZAÇÃO PAN AMERICANA DE SAÚDE. Câncer. Brasília: OPAS/OMS Brasil, 2020. Disponível em: <https://www.paho.org/pt/topicos/cancer>. Acesso em: 21 jul. 2023.

SILVA, M. J. S. *et al*. Política de Atenção ao Câncer no Brasil após a Criação do Sistema Único de Saúde. Revista Brasileira de Cancerologia, Rio de Janeiro, v. 63, n. 3, p. 177-187, 2017. Disponível em: <https://doi.org/10.32635/2176-9745.RBC.2017v63n3.133>. Acesso em: 27 jul. 2023.

RIBEIRO, A. A.; NARDOCCI, A. C. Desigualdades socioeconômicas na incidência e mortalidade por câncer: revisão de estudos ecológicos, 1998-2008. Saúde e Sociedade, São Paulo, v. 22, n. 3, p. 878-891, set. 2013. Disponível em: <https://doi.org/10.1590/S0104-12902013000300020>. Acesso em: 27 jul. 2023.

RIVENBARK, A. G.; O'CONNOR, S. M.; COLEMAN, W. B. Molecular and cellular heterogeneity in breast cancer: challenges for personalized medicine. The American Journal of Pathology, v. 183, n. 4, p. 1113-1124, out. 2013. Disponível em: <https://doi.org/10.1016/j.ajpath.2013.08.002>. Acesso em: 27 jul. 2023.

ROSA, L. M.; RADÜNZ, V. Taxa de sobrevida na mulher com câncer de mama: estudo de revisão. Texto & Contexto - Enfermagem, Florianópolis, v. 21, p. 980- 187 989, dez. 2012. Disponível em: <https://doi.org/10.1590/S0104-07072012000400031>. Acesso em: 27 jul. 2023.

SIQUEIRA, A. S. E. *et al*. Impacto econômico das internações, quimioterapias e afastamentos por neoplasia maligna de mama no Brasil. Diversitates, Niterói, v. 8, n. 1, jul. 2016. Disponível em: <http://www.diversitates.uff.br/index.php/1diversitates-uff1/article/view/110>. Acesso em: 27 jul. 2023.

SUNG *et al*. Global cancer statistics 2020: GLOBOCAN estimates of incidence ortality worldwide for 36 cancers in 185 countries. CA: A Cancer Journal for Clinicians, v. 71, n. 3, p. 209-249, 2021. Disponível em: <https://doi.org/10.3322/caac.21660>. Acesso em: 27 jul. 2023.

TEIXEIRA, L. A. O controle do câncer no Brasil na primeira metade do século XX. História, Ciências, Saúde – Manguinhos, Rio de Janeiro, v. 17, supl. 1, p. 13-31, 2010. Disponível em: < https://doi.org/10.1590/S0104-59702010000500002>. Acesso em: 27 jul. 2023.

TEIXEIRA, L. A.; PORTO, M.; HABIB, P. A. B. B. Políticas públicas de controle de câncer no Brasil: elementos de uma trajetória. Caderno de Saúde Coletiva, Rio de Janeiro, v. 20, n. 3, p. 375-380, 2012. Disponível em: <https://www.arca.fiocruz.br/handle/icict/23906>. Acesso em: 27 jul. 2023.

ZAPPONI, A. L. B.; MELO, E. C. P. Distribuição da mortalidade por câncer de mama e de colo de útero segundo regiões brasileiras. Revista Enfermagem UERJ, Rio de Janeiro, v. 18, p. 628-631, dez. 2010. Disponível em: <http://www.revenf.bvs.br/pdf/reuerj/v18n4/v18n4a21.pdf>. Acesso em: 27 jul. 2023.

Case report: Pulmonary sequestration with gastric fistula in a 20-year-old woman

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ABSTRACT

Bronchopulmonary sequestration (BPS) is a rare condition characterized by the presence of lung tissue without function and without connection with the airways and may present in two forms: intralobar or extralobar.1 More rarely, BPS may be associated with a gastrointestinal fistula. We report the case of a 20-year-old patient with a history of recurrent pneumonia and dependent ventilatory chest pain who, after contrast-enhanced chest computed tomography and upper digestive endoscopy, was diagnosed with pulmonary sequestration of the medial basal segment and presence of gastric fistula in the cardia region. The treatment was successfully performed through a left lobectomy.

Keywords: Bronchopulmonary sequestration, Gastric fistula, Congenital malformation.

1 INTRODUCTION

Bronchopulmonary sequestration (BPS) is defined as a congenital malformation of the lower respiratory tract in which there is the presence of non-functioning lung tissue, with no connection to the airways and systemic arterial blood supply.[1] The incidence is rare, corresponding to 0.15 to 6.4% of lower respiratory malformations and is responsible for about 1.1 to 1.8% of lung resections.[2-3]

This condition can present itself in two forms that are differentiated by the origin of the visceral pleura adjacent to the malformation. The intralobar form presents visceral pleura of the adjacent lung, while extralobar sequestration is contained in its own visceral pleura, separate from the involved lung.[4] In rare cases, there may be a connection of this anomalous lung tissue to the gastrointestinal tract, being called bronchopulmonary malformation of the primitive intestine, which is related to the abnormal differentiation of the respiratory and upper gastrointestinal tracts during early embryonic development.[5]

2 REPORT

A 20-year-old woman was referred to the Hospital de Clínicas de Curitiba complaining of low back pain on the left beginning 6 days ago, with a ventilatory-dependent pattern. He also had a productive cough and fever of 37.9 ºC. On pulmonary auscultation, reduced vesicular murmur on the left, without adventitious noises. He had no gastrointestinal complaints.

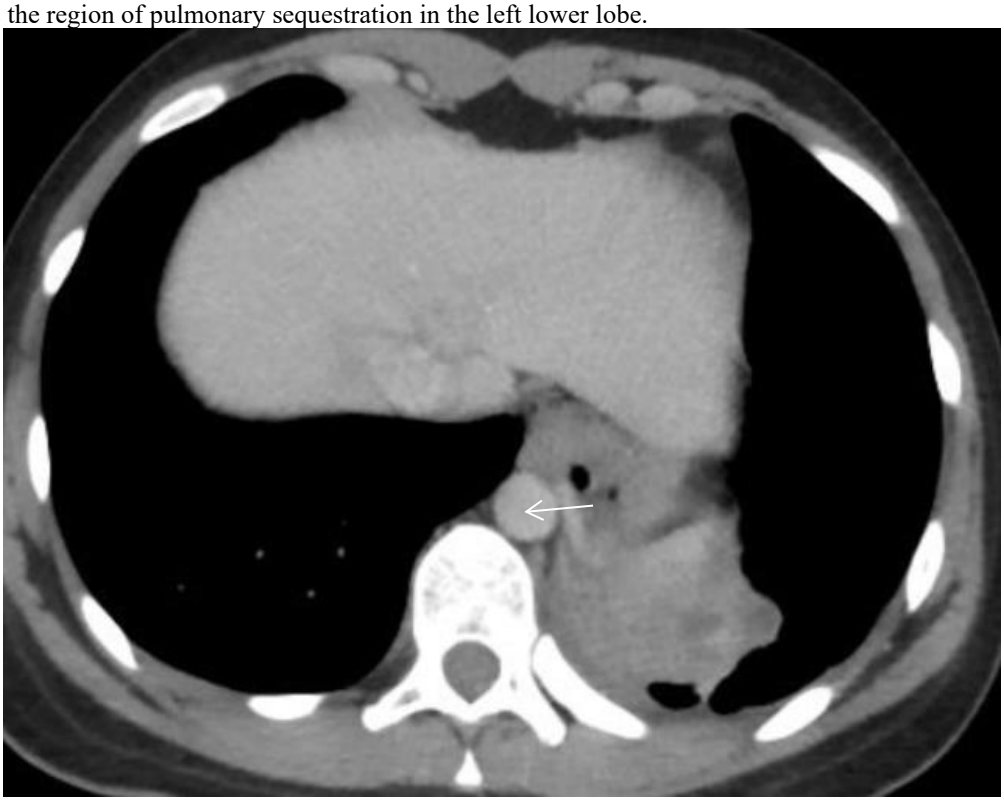
The patient reported a history of recurrent lower airway infections in one of these episodes, hospitalized with a diagnosis of lung abscess treated with antibiotic therapy for a prolonged time.

During their care in our service, laboratory tests that suggested an infectious condition were requested. A contrast-enhanced computed tomography scan of the chest showed a lobulated image in the lower lobe of the left lung, containing a small arterial branch from the celiac trunk, dilated bronchi and cavities in the left pulmonary base. In its internal margin, a linear path was observed that suggested a fistula to the distal esophagus and, because of this finding, an upper digestive endoscopy was performed, which confirmed the presence of a fistula in the cardia region.

After the examinations and discussion of the case, the diagnostic conclusion of pulmonary sequestration of the medial basal segment with arterial supply of the celiac trunk and presence of gastric fistula in the cardia region was reached.

Left inferior lobectomy was performed with cautious dissection of the esophageal fistula path, oversuture of its origin and local reinforcement with mediastinal pleura tissue. Uneventful procedure.

Figure 1. Computed tomography with intravenous contrast injection showing a small arterial branch from the celiac trunk that nourishes the region of pulmonary sequestration in the left lower lobe.



3 DISCUSSION

The presence of pulmonary sequestration associated with communication with the gastrointestinal tract (usually esophagus or stomach) is very rare and poorly described in the literature. Its embryological formation comes from a defect in the formation of the primitive intestine.[5]

The diagnosis is usually made during childhood, but in rare cases it can be diagnosed in adulthood. The most frequent symptoms are cough, hemoptysis, and pleural effusion.[6] In addition, the presence of BPS is related to a history of recurrent pneumonia, which may be the only form of presentation that will lead to the diagnosis.[7]

The SBP is divided into intralobar and extralobar form and has a systemic rather than pulmonary arterial supply.[8] A small retrospective study, which evaluated 8 cases of BPS, showed a predominance of this condition in the left lower lobe and in the intralobar form.[9] In another retrospective study, in which patients with BPS were evaluated, 15 adults and 13 children, the arterial circulation of the malformation came mainly from the thoracic aorta, originating from the abdominal aorta only in 35% of the patients analyzed.[2]

Imaging tests are essential for diagnosis. Among them, computed tomography of the chest stands out, which demonstrates the presence of a well-defined mass with possible cystic changes and surrounding emphysematous changes in the lung parenchyma10. The presence of aberrant vessels at pulmonary sequestration can be seen on tomography, but it is suggested that more specific tests, such as arteriography (gold standard), be performed to detail the characteristics of the arterial branch that supplies the lesion, facilitating the subsequent surgical approach.[11th]

Treatment depends on the patient's condition and his symptomatology. Resection of pulmonary sequestration, either by lobectomy or segmentectomy, is indicated for the prevention of infections and/or for symptom control, and its surgical treatment is controversial in asymptomatic patients.[2] This procedure has minimal morbidity, and most of it has a good prognosis.[12th]

4 CONCLUSION

Despite being a rare condition and little described in the literature, its early diagnosis is essential for the prevention of recurrent respiratory infections and improvement of symptoms, when present. Surgical treatment brings good results.

REFERENCES

Landing, B. H. & Dixon, L. G. Congenital malformations and genetic disorders of the respiratory tract (larynx, trachea, bronchi, and lungs). The American review of respiratory disease 120, 151–85 (1979).

van Raemdonck, D. et al. Pulmonary sequestration: a comparison between pediatric and adult patients. European journal of cardio-thoracic surgery: official journal of the European Association for Cardio-thoracic Surgery 19, 388–95 (2001).

Carter R. Pulmonary sequestration. Ann Thorac Surg 1969;7:68±88

Cooke CR. Bronchopulmonary sequestration. Respir Care. 2006 Jun;51(6):661-4.

Oyachi N, Numano F, Koizumi K, Shinohara T, Matsubara H. Congenital communicating bronchopulmonary foregut malformation including ectopic pancreatic tissue in an infant. *Surg Case Rep*. 2021;7(1):128.

Savic, B., Birtel, F. J., Tholen, W., Funke, H. D. & Knoche, R. Lung sequestration: report of seven cases and review of 540 published cases. Thorax 34, 96–101 (1979).

Hertzenberg, C., Daon, E. & Kramer, J. Intralobar pulmonary sequestration in adults: three case reports. Journal of thoracic disease 4, 516–9 (2012).

Pryce DM. Lower accessory pulmonary with intralobar sequestration of lung: report of seven cases. J Pathol 1946;58:457-67.

Vieira J., Rego A., Oliveira A., Sa Ferreira D., Furtado A., Couceiro A, et al. Bronchopulmonary sequestration – a 12-year experience. Rev Port Pneumol, 12 (2006); 489-501.

Naffaa, L., Tank, J., Ali, S. & Ong, C. Bronchopulmonary sequestration in a 60 year old man. Journal of radiology case reports 8, 32–9 (2014).

Petersen, G., Martin, U., Singhal, A. & Criner, G. J. Intralobar sequestration in the middle-aged and elderly adult: recognition and radiographic evaluation. The Journal of thoracic and cardiovascular surgery 126, 2086–90 (2003).

Samuel, M. & Burge, D. M. Management of antenatally diagnosed pulmonary sequestration associated with congenital cystic adenomatoid malformation. Thorax 54, 701–6 (1999).

SEVEN
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Body and repetitive memory in autism

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ABSTRACT

Objective: The objective of this work is to present the body as a memory of repetition in Autism and what would be the consequences arising from placing this body in relation to the internal and external world, with spaces, others and oneself. Methodology: The meaning can always be different and, in the specificity of the constitution of the autistic subject. Thus, the production of meanings is understood in comparisons, relations, dissonances, approximations and displacements. It is in the event and in the analysis of other materialities (non-linguistic) that we will present the results. Results: The experiential experiences of childhood and the relationships between mother and baby are paramount for the subjective constitution and the production of meanings in the formation of the psyche. The affective life, the emotions, the identifications and the strengthening of the bonds of social belonging are anchored in this phase and from there emanate all the threads that link the unconscious content. The study of the history of the mother A.S. and her relationship with the little R.A. demonstrated that the child with autism is constituted in the regressive and partial primary and secondary identifications, with a singularity of its own constituted in the repetition. The symbolic and imaginary contents to remember and repeat are repeated without success in the elaboration. Conclusion: From the personal history of the mother A.S. and the son R.A., all the premises about the affective life, formation of the psyche and unconscious come from the studies of Sigmund Freud and the successor psychoanalysts who affirmed or refuted his writings, contributing to psychoanalysis becoming a theory in process. The case study presented in this paper is about the four-year-old R.A. and his mother, his personal history and the constitution of a subjective body in the memory of repetition.

Keywords: Psychoanalysis, autism, repeating memory, body, subjectivity.

1 INTRODUCTION

The term autism was first used by Eugen Bleuler, still related to the studies of Schizophrenia, with identification of the symptoms inherent to the orientation to subjective life that alters the perception of the world (autism in the conception of Eugen Bleuler), lack of unity of consciousness, presence of characteristic symptoms, evolution with inevitable deterioration and a multidimensional construction. So, what was described as 4 (four) A(s), by E. Bleuler, are, consequently, 6 (six) symptomatic behaviors: ambivalence, blunted affect, associations and dissociations of thought, attention impairment, blunted affect and autism.

> The hypothesis, which is Freudian and validated by the casuistry already published, that the autistic's detachment from reality is never total, is indicative of the possibility of establishing a libidinal bond with the autistic (Quinet, 1999).

The studies on autism also come from the research of the Austrian psychiatrist based in the United States Leo Kanner, in 1943, thus publishing the work *Autistic Disturbances of Affective Contact known as Autistic Disorder of* Affective Contact. In the journal *Nervous Children,* Kanner described the cases of eleven children with an obsession with preserving sameness and extreme isolation from birth. Already in this description we notice a relationship with the intensity of imaginative life, aloeism and absence of responses to stimuli of externality.

> Leo Kanner (1943) described under the term *Autistic Affective Contact Disorder* a picture that he characterized by "extreme autism, obsessiveness, stereotypies and echolalia", relating them to phenomena of the schizophrenic line. (Volkmar *et al.*, 1997)

In this orientation, there are vital needs that cause us to continue even when we are exasperated and tired or without a clear expectation of reaching some external object. Different from what is thought, the demand of life does not come from what we want from the external world, that is, from our material aspirations. This does not cause us melancholy.

> Melancholy is characterized, in psychic terms, by a painful dejection, a cessation of interest in the outside world, loss of the capacity to love, inhibition of all activity and decreased self-esteem. (Freud, 1914).

Mourning for Freud (Mourning and Melancholy, FREUD, 1917/2010) is the cause for the relative impoverishment of the self and inhibition of the mechanism of topographic balance, which feeds only one of the instances in the topic.

> Psychoanalysis informs us that there are two methods of finding an object. The first (...) is the 'anaclitic' or linkage, based on the attachment to primitive infantile prototypes. The second is the narcissist who seeks the individual's own ego and finds it again in another person. The latter method is of quite great importance in cases where the result is pathological (Freud, 1915, p. 229).

Reactions to loss are ideal or material in nature. About melancholy, we can associate the various biases present in the Freudian description of the grieving process. There is the impoverishment of the self and one has in it the lost object, which when it is decharacterized, depersonalizes itself.

> It is through the search for a past and outdated satisfaction that the new object is sought, and that it is found and apprehended elsewhere than at the point where it is sought. There is a fundamental distance there, introduced by the essentially conflictual element included in every object search. (Lacan, 1994/1995, p. 13).

It is important to confirm that of this beacon, the psychotic structure is very similar to the symptoms of this melancholy, even though it is a very delicate subject and, in the discussions, several

authors do not agree with this type of positioning, we now use the line of clinical reasoning of approximation of this autism with psychosis.

> (...) a much more energetic and successful defensive modality, which consists in the self-rejecting the unbearable representation, along with affection, and behaving as if the representation had never appeared. But the moment he achieved this the person finds himself in a psychosis that admits no other classification than 'hallucinatory confusion' (Freud, 1893-1899/1987, p. 59).

According to Jerusalinsky (2012), autism is a structure alongside psychosis, neurosis and perversion. The subject who appropriates language and is out of step in breaking with the signifiers of the other is inserted in psychosis. This does not seem to be the case, because the defense mechanism at work in autism is exclusion and not foraclusion.

> (...) In psychiatry this idea of a clearly defined disease is always erroneous, because each condition of psychiatric illness is mixed with deviations that belong to normal development. The details of the disease, childhood schizophrenia, really spread everywhere, and can be found in the description of any normal child" (Winnicott, 1963/1996 p. 176-177).

There is, in this case, an aversivity that is the result of a contained displeasure and led to tension, which expresses the motor movements, stereotyped, and repetition. One can imprint on circularity all the tendency to excess energy that should be detached to the external object and back to the ego, constantly.

> Displeasure is always an expression of a higher degree of tension, and that, therefore, what occurs is that a quantity in the field of material events is transformed, here as elsewhere, into the psychic quality of displeasure [...] We recognize our mental apparatus as being, above all, a device meant to master the arousals that would otherwise be felt as distressing or have pathogenic effects. (Freud, 1914/2006, p. 92).

The most complex in the process of relations with autism is to understand that the lost object does not bring pain but rather pinches the process of emptiness, for the replacement of this object, without the understanding of the identity of thought. For Freud, the painful thing is not the loss of the object but the hard work of grief and its *hypersense of* connection to the representation of the lost object. Which is then eclipsed/fused at the same time as it makes a shadow.

> The human organism is, at first, incapable of promoting this specific action. It is affected by the help of others, when the attention of an experienced person is turned to an infantile state by discharge through the alteration pathway. This route of discharge thus acquires the all-important secondary function of communication, and the initial helplessness of human beings is the primary source of all moral motives. (Freud, 1895/2006, p. 379).

In this case, the pain of bonding is that it requires *hyperinvestment and not* the pain of separation, what hurts is not to separate but to cling more and more. Bringing to the case of autism,

there is a universe of sensations that are responsible for this substitution, which is copiously experienced and experienced in circularity.

> The repressed is, for us, the prototype of the unconscious. We realize, however, that we have two kinds of unconscious: one that is latent but capable of becoming conscious, and another that is repressed and is not in itself and without further work, capable of becoming conscious. (Freud, 1996, p28).

For autism, then, we must cast the apparent and decisive distinction for the clinic on the elementary concepts between loss and lack. The defense is in a constantly narcissistic relationship to overcome the depressive process of a withdrawal and exclusion and resulting from this the substitution, as a propelling element of the process of family healing to indifference and detachment. To overcome this isolation, there is a loss of reality that is distinguished in neurosis and psychosis.

> In neurosis, a fragment of reality is avoided by a *kind of escape,* whereas in psychosis, the initial escape is succeeded by an *active phase of remodeling;* In neurosis, initial obedience is succeeded by a delayed escape attempt. Or, to put it another way: neurosis does not repudiate reality, it merely ignores it; psychosis repudiates it and tries to replace it. (Freud, 1924/2006, p. 209).

In the opposite direction of loss, there is lack, functioning as a propellant of the desire for life that detaches itself from loss as an incursion into the perceptual identity of connection to the lost object. As an antidote to loss, there is only the substitutionary representation of lack. And it is on this path that autism can be served.

> It is about the phallus, and about knowing how the child realizes more or less consciously that his omnipotent mother is fundamentally lacking in something, and it is always the question of knowing by what way she will give him this missing object, and that she always lacks herself. (Lacan, 1956-57/1995, p. 196).

According to Freud (1900), only desire is able to put the psychic apparatus into action. The primeval experience refers to the reminiscences of the baby's experiences that still persist in our body sculpted in the psychic memory.

> Traumas are either experiences about the individual's own body or sensory perceptions, mainly of something seen or heard, that is, experiences or impressions. (Freud [1938] 1996, p. 89).

The prototypes are hunger and the breast and the search is for satisfaction of this first experience of pleasure. It is in the encounter between the need and the other that the tension dissipates and the pleasure settles in. This other is what makes the role of promoter of this first satisfaction and of fulfiller of the function of primary care and protection.

> The totality of the event then constitutes the experience of satisfaction, which has the most radical consequences on the development of the functions of the individual. (Freud, 1886-1889/1996, p.370).

The mental tread or facilitation is the repetition of this activity that is satisfied in the whole process of constitution of contemplation of a perceptual identity, which is also hallucinatory.

> (...) The self-separates itself from the unbearable representation, but this is inseparably interwoven with a fragment of reality, and as the self carries out this operation, it also departs, totally or partially, from reality. The latter is, in my opinion, the condition under which a hallucinatory vivacity is attributed to one's own representations and, thus, after a successful defense, the person falls into hallucinatory confusion (Freud, 1893-1899/1987, p. 60).

Freud treats it as hallucination, because the insistence on the reach of perceptual identity allows the exhaustive investment in the representation of this primeval experience leading to the confusion of sense perception, with signs that refer to senses that are not real in time and in the event, but are in the memory of the repressed discourse of the subject. The imagery trace left by the experience of satisfaction is temporalized in the actualization of the saying, which is an action, but does not cease to merge in the hallucinatory act. And it is in this path, that once again, there is an approach to psychosis.

> The seizure of the body by the subject requires, however, that a new operation take place. This operation, by which the body is subjective, is of the order of the imaginary, in that it depends on the investment of an image – the image of the body (Elia, 1995, pp. 152–153).

Contrary to the identity of perception, as a hallucinatory way of satisfying desire, thought arises, which by an indirect channel of fulfillment of this experience of satisfaction characterizes what it calls the identity of thought. The body will not be satisfied with the image, it desires the material and this movement will not be able to meet this need, resulting in the experience of helplessness. The wear and tear of investment in this imagery experience that will not be enough to feed the body is unnecessary, but it does ruin the investment that would produce the satisfaction of the libido.

> Anxiety is something that one feels, affective state. As a feeling, anxiety has a very pronounced character of displeasure. It is accompanied by more or less defined physical sensations that can be referred to specific organs of the body. The generation of anxiety sets the generation of symptoms in motion and is, in fact, a prerequisite of it. (FREUD, 1926/1986, p. 155).

What requires drive comes from within. The demands of life then come from within us and from the vital necessities of existence. The discharge pathway is related to the pleasure principle and comes from inside the body. For Freud (1915/2004), the demands of life are essentially those arising from the interior of the body and from vital needs.

The source of the drive is endogenous, we call it the source of the interior of the body, by its constancy and its action is in the failure of the reflex mechanism of dealing with the external factors of desire and how this can be modulated with the internal desire. The experiences and vicissitudes of our body are mentally inscribed and neuroses are responses to the inscriptions and demands of work to maintain balance and pacification. It is on the boundary between the somatic and the psychic that the drive settles in.

> The drive is the psychic representative of the stimuli that come from within the body and reach the psyche, as a measure of work requirement imposed on the psychic as a result of his relationship with the body. (Freud, 1915)

The experience of satisfaction is the starting point to deal with the accumulation of energy from somatic needs and psychic activities. This experience is gradual and the body is the mediator of this experience. It is through my own body that I experience myself and the other and also the world we see and we need to learn experientially to see it.

There is an action and reaction in what is expected of the attitudes of a subject towards the experiential experiences. In these relationships only desire moves and energizes the psychic apparatus. If the blockage in libidinal investment or desire becomes scarce, the psychic movement loses its rhythm. Wanting something is part of the phenomenon that puts to turn the psychic apparatus and in this decrease of pulsional investment, the fuel capable of animating the experiences becomes insufficient and the wheel stops turning.

According to Freud (1900), only desire is able to put the psychic apparatus into action. The primeval experience refers to the reminiscences of the baby's experiences that still persist in our body sculpted in the psychic memory. The prototypes are hunger and the breast and the search is for satisfaction of this first experience of pleasure.

It can be said, then, that it is in the encounter between the need and the other that the tension dissipates and the pleasure settles. This other is what makes the role of promoter of this first satisfaction and of accomplishing the function of primary care and protection The path or mental facilitation is the repetition of this activity that is satisfied in the whole process of constitution of contemplation of a perceptual identity, which is also hallucinatory.

Freud treats it as hallucination, because the insistence on the reach of perceptual identity allows the exhaustive investment in the representation of this primeval experience leading to confusion of sense perception, with signs that refer to meanings that are not real with regard to the temporality of the event, but are in the memory of the repressed discourse of the subject. The imagery trace left by the experience of satisfaction, it temporalizes in the actualization of the saying, which is an action, but does not cease to merge in the hallucinatory act, which is also a type of repetition.

The autistic subject does not feel equal pleasure, but is satisfied with the corresponding updating of the experience, starting to seek reparation in the loss. In this game of conformation, there are no winners. The *mnemic mark* refers to the reminiscences of this support that inscribed in memory is located as an image in the scope of what will be the real of the impossible. This satisfaction is hallucinatory and will bring failure in the impulse investment, because it results in a mental confusion and confrontation between desire and need.

2 METHOD

The meaning can always be different and, in the specificity of the constitution of the autistic subject, literally, the others (alteration and intensity of the focus on people). In Discourse Analysis (DA), we use movement and relationship as a theoretical-analytical device. Thus, the production of meanings is understood in comparisons, relations, dissonances, approximations and displacements.

The internal, external and transitional psychic spaces are diffuse in autism, due to an impoverished partial identification and the use of the transitional object in an inappropriate and inconsistent way. Social withdrawal can be a manifestation that erects an unfinished process of strengthening a *self and an absence of* holding and *handling,* if not accommodation of the psyche in the body and, also, absence of time-space integration.

It is necessary to observe that a concept in AD is beyond relational, of an imbricated nature, because interdependence occurs in the emergence of meaning. This notion of archive occurs as a reading of material structure for writings and objects and also as memory, constituting itself as a significant materiality. Thus, autism has its concept in this psychoanalytic lens, in addition to nuclear, based on material historicity.

The central point of the methodology used when thinking about autism is that there is a consonance between the recognition of speech, not only as oral and written verbalization, but also of images, pictorial, forms and the realization of the memorable meanings in repetition. Thus, the event is an important term in AD, because for Pêcheux, (1975) the structure of the discourse is the language and when thinking of language, we almost always associate it with the verbal, being it a significant materiality equally of the non-verbal.

3 R.A. AND A.S. AND REPETITION MEMORY IN AUTISM

According to maternal report:

> *R.A. since he was a baby had a lot of resistance to put on slippers, and closed shoes, but it was resistance even from a lot of crying.*
> *So, we put only sandals.*
> *When he started to go to the nursery we tried again, the slipper even with the elastic, he just did not stop shoes, he was walking and taking off the slipper.*
> *Until the time came for hippotherapy, we had to put on our shoes. I reported it to the psychologists, and they started working it out with him.*
> *Every day he went to therapy.*
> *He put his shoe on it and repeated it to include in the neural pattern*
> *Walked 1 (one) min*
> *And he took it off*
> *Another day 2 (two) min*
> *And he took it off*
> *And so, it was increasing*
> *Here, at home when we were going to go out, I also put on my shoe closed*
> *Even if getting in the car he was going to take it off*
> *Then I'd put it back on when we were going to go out*
> *When we realized it, he already agreed to wear it*
> *Without crying*

Already with the slipper it was different, a little more difficult.
I related to my mother his fixed interest in the Minions, when he plays a song, or when he sees a Minions doll in the street, he is amazed.
Then my mother said she would buy him the Minions slipper
To see if he would be interested
When she arrived with the slipper, he saw the drawing opened such a beautiful smile
And pants
We walked repeatedly with him at home, and now we are in the training of walking with the slipper at home and then generalized to a natural environment.
He already makes a point of putting on the sandals of the minions.
With 1 (one) week that he won the slipper and is already wearing well. In a sequenced way.
I thought: how fixed and repetitive interest makes a difference for them!
Today I know that everything that has Minions, means of transport (truck, bus and train) holds his total attention and motivates him to perform the instrumental activities of daily living.

3 DISCUSSION

The report of the mother A.S. confirmed that the little R.A. from an early age developed a resistance in the use of clothing and footwear, mainly by footwear (tactile aversivity/DSM-5 – Diagnostic criterion B4/Hyper-reactivity and hypo-reactivity), accustomed, then, to remain barefoot. This more intense sensitivity caused a flight of demand, or even an avoidance to perform functional or personal care activities, such as dressing occasionally for parties and events that required a more formal dress or another task that required a better developed tactile skill.

As much as the mother insisted on the use of closed shoes or even the most open ones as a flip-flop or any other of this nature, he did not accept and presented negative behaviors or threw a tantrum. The change occurred from the moment the mother started an activity with memory of repetition and reward, from compliments and words of security and support, with the aim of making him more comfortable and safer. The memory of repetition in autism is one of the most promising strategies in the affective relationships of the child and his mother, maintaining the bond of social and family belonging.

According to the mother's account, little R.A. has always had a preference for minions, which are fictional characters of yellow color in the form of pills, and all are equal and behave in a similar and coordinated way, corresponding to the repertoire of the child with autism, maintaining their routine and their self-regulation. His maternal grandmother, knowing this network of preference and understanding the situation, presented her grandson with a slipper of the minions, R.A.'s favorite character.

This initiative inaugurated the trait of primary and regressive identification and, after this reinforcement in strengthening the bonds of social belonging with the family, enabled an identification and transfer of libidinal energy to an external object. According to his mother's account: "He no longer takes off his slipper from the minions for nothing."

4 FINAL CONSIDERATIONS

In the infantile phase, there is a moment of transition that occurs in overcoming the stage of absolute dependence to the relative one. This direction occurs to the extent that the baby has access to transitional objects and / or transitional phenomena, which in the case of R.A., son of the mother A.S, was the insistence on the sameness of the minion characters and was presented by the maternal grandmother with sandals with the images of the drawing. The memory of repetition in autism happens initially with the motivating element, as a network of preference that, later, is the space of expansion of the social communication of this child.

The care of daily life is expressed in adaptations and arrangements of environments, contexts and situations that come from all forms and in multiple directions and related to an uncountable universe of actions of protection and care to the knowledge that he needs to have to become independent and able to develop the instrumental activities of daily living.

In the case of this relationship between R.A and his mother A.S., two fundamental procedures are perceived for the repetition memory to be effective. The first is the structuring of a self from the primary and secondary identifications in the family context. The second, and most important, is the effort of this satisfactorily good environment to endure even after the initial months of this psychosome. A good breast that expands and extends its primary maternal care for the integrality of this subject, and was constituted in subjectivity.

REFERENCES

American Psychiatry Association. *Diagnostic and Statistical Manual of Mental disorders - DSM-5.* 5th.ed. Washington: American Psychiatric Association, 2013.

LACAN, J. (1964*). O Seminário, Livro 11: Os quatro conceitos fundamentais da psicanálise. Rio de Janeiro. Jorge Zahar Editor, 1992.*

MELO-FILHO, Julio de. Psicossomática hoje/Julio de Mello-Filho [et al.]. – 2. Ed. – Porto Alegre: Artmed, 2010.

Organização Mundial da Saúde-OMS. *Classificação Estatística Internacional de Doenças e Problemas Relacionados à Saúde. CID-l0.* 8. São Paulo: EDUSP, 2000. 119p.

SOUSA. C. C. Psicopatologia Psicanalítica: o estudo do homem pela determinação dos seus desejos e conflitos inconscientes. Novas Edições Acadêmicas (*International Book Market Service Ltd., member of OmniScriptum Publishing Group*), Mauritius, 2020.

SILVA, Maria Cecília A. e. **Psicopedagogia**: em busca de uma fundamentação teórica. Rio de Janeiro: Nova Fronteira, 1998.

VISCA, Jorge. **Clínica psicopedagógica**: epistemologia convergente. São José dos Campos: Pulso Editorial, 2010.

WEISS, M.L.L. **Vencendo as dificuldades de aprendizagem escolar**. Rio de Janeiro: Wak Editora, 2009.

WEISS, Maria Lúcia L. **Psicopedagogia clínica**: uma visão diagnóstica dos problemas de aprendizagem. Rio de Janeiro: DP&A, 2006.

ATTACHMENT

PHOTOGRAPHIC RECORDS

Figure 1. Development of pairing skills to perform identification, discrimination, generalization and naming.



Figure 2. This activity is for R.A. to name the slipper and know its function, characteristic and class. It is important for the development of developmental skills of personal and functional care, in instrumental activities of daily living.



Figure 3. The first results of the activities of pairing to the model and discrimination and generalization in the natural environment of R.A., with the mother at the side reinforcing and establishing the bonds of





SEVEN
publicações acadêmicas

T2 transtibial amputation and gait training after lower limb prosthetization from an occupational therapeutic perspective: an experience report

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ABSTRACT

Introduction: Amputation is the traumatic or surgical removal of a limb. Assistive Technology collaborates in the process of social readaptation of the amputee through the development of prostheses. This device allows to recover the functional independence and autonomy of the patient in daily activities. Objective: The present study aimed to describe the gait training of a transtibial amputation patient. Method: It is a case report of descriptive, narrative and reflective character, coming from the clinical practice in Occupational Therapy in the Laboratory of Assistive Technology (LABTA). A literature review was performed in databases. Results: This study presents two phases of care for people with amputation; the pre-prosthetic and post-prosthetic phases. In the first phase there is the preparation of the stump: strengthening of the muscles, training of the bandage of the stump and others, while in the second phase, there are the training of use of the prosthesis, to provide independence in daily activities and functional mobility, especially transfer and ambulation. Conclusion: The amputation causes occupational limitations to the individual bringing damages to the biopsychosocial level. Therefore, a careful evaluation should be made by the Occupational Therapist considering the previous functional capacity and occupational history of the patient. Thus, programs should perceive the patient, in their goals and ambitions to better assist and benefit them.

Keywords: Amputation, orthopedic procedures, lower limb prosthesis, gait training, occupational therapy.

1 INTRODUCTION

Amputation can be defined by the traumatic or surgical removal of a limb in part or in whole (BRAZIL, 2018). In the case of Lower Limbs – LLLL. Those that are performed above the level of

the ankle, whether transtibial, transfemoral, knee disarticulations or hip disarticulations, are considered as larger, while the smallest are those restricted to the toes or at the level of the foot (whether transmetatarsal amputations, tarsometathartic or Lisfranc disarticulations, or medium-tarsal or Chopart's disarticulations) (KOLOSSVÁRY, et. al, 2015; JESUS-SILVA, 2017).

In studies of Negretti et. al, (2019) it was emphasized that amputees increasingly rely on a diversity of Assistive Technology – AT to collaborate in the process of social readaptation, among them, we can mention the prosthesis. This device allows to recover the functional independence and autonomy of the patient, the performance of the daily activities developed before the trauma and contribute to a better social participation.

The AT service has several professionals, among them, the occupational therapist, who will give emphasis, the confection itself, functional training, automation of posture and gait, training of placement and removal of the prosthesis and orthosis, architectural adaptations and clothing, in addition, will assist in occupational performance (RODRIGUES JÚNIOR, et. al, 2018).

Amputation at a level where the skin is viable and the musculature preserved, can provide better adaptation of prostheses and rehabilitation of the patient. This is due to the independence provided by the level of amputation favorable to the muscles, which enables the development of daily activities, better gait pattern and locomotion (MATOS, 2019).

Therefore, knowing the scarcity of studies using occupational therapeutic analysis about amputation and the importance of these data for the rehabilitation process of patients, the present study aimed to describe the gait training of a transtibial amputation patient.

2 METHODOLOGIES

This study is a case report of a descriptive, narrative and reflective nature, whose data come from the clinical practice in Occupational Therapy at the Laboratory of Assistive Technology (LABTA) in the manufacture of endoskeletal prosthesis of the type Kondylen Bettung Münster (KBM) and training of Activities of Daily Living (ADL) in a patient with transtibial amputation of level T2.

Initially, a literature review was performed in reference databases such as CAPES Periodicals Portal, Scientific Electronic Library Online (SciELO), Latin American and Caribbean Literature in Health Sciences (LILACS), Medline, PubMed and Virtual Health Library (VHL). In addition to research in journals (Research, Society and Development and Occupational Therapy Notebook of UFSCar). Books on the subject and government websites were also used in order to obtain a sufficiently concrete theoretical and practical basis on the rehabilitation of amputated limbs and prosthetization. Localized articles must be in Portuguese, English and/or Spanish and have been published in the last 10 years (with the exception of classic authors).

3 CASE DESCRIPTION

The patient A.L., is 60 years old, is female, is 71 kg, measures 1.56 m in height, with a body mass index (BMI) of 29.26 Kg/m², and has a transtibial amputation of T2 level in the right lower limb due to diabetes mellitus. She arrived at the Teaching and Assistance Unit in Physical Therapy and Occupational Therapy (UEAFTO), accompanied by her sister and making use of a wheelchair for locomotion, in order to perform evaluation and Occupational Therapeutic monitoring.

4 RESULTS AND DISCUSSIONS

The rehabilitation program at UEAFTO with LABTA, for lower limb amputations is divided into two stages: pre and post-prosthetic. The pre-prosthetic phase is the period of intervention prior to prosthesis. In the first stage, emphasis is placed on the preparation and modeling of the stump, bandaging, sensory stimulation, pain relief, prevention of deformities, positioning orientations, adaptations, mobility gain, weight transfer, awareness of limb loss, reorganization of posture and body image.

In the pre-prosthetic phase, it was observed that patient A. L. presented deformities in the lateral and medial condyle of the femur, which would imply a pressure point when performing motor training with the prosthesis. In this sense, in order to reduce these points, the technique of bandaging the stump, sensory stimulation and positioning guidelines was developed.

In the interventions of the pre-prosthetic phase, the competence of the occupational therapist is to work on the preparation of the stump: strengthening of the musculature, training of the bandage of the stump, treatment of the scar, care with the pain and sensation of the phantom limb, restructuring of the body image, etc. In order to prosthetize and perform training for independence in their occupations (BRAZIL, 2018).

According to Trombly (2013), it is the function of the occupational therapist to advise on the care of the postoperative injury, maintenance of the integrality of the skin, favor joint mobility, reduction of edema and pain control. In addition, the occupational therapist can also provide emotional support, promote desensitization of the stump, stimulate the strength and joint mobility of the remaining follow-up and the other limb to enable the subsequent prosthetization.

In the second stage of care for the person with amputation, the occupational therapist performs the training of prosthesis use from the transfer of weight on the prosthesis, sitting and lifting, going up and down stairs, etc. (BRAZIL, 2018). Also, static and dynamic balance on flat and/or unstable surfaces. In order to provide independence in ADL functional mobility, especially transfer and ambulation (AOTA, 2015; GOMES, et. al, 2021).

The use of the prosthesis can provide function of sitting symmetry, sitting balance, pressure distribution, transfers, less assistance during gait, improvement of gravitational safety, reorganization

of the body scheme, improvements in postural balance, self-esteem and well-being (VAROTO, 2021). The main outcome of functional capacity, which was found in all articles of this search, was the ability to walk with the prosthesis and independence during gait and secondary use of the prosthesis in the ability to perform ADL and IADL.

In the post-prosthetization phase, it was observed that during the swing phase of the gait A. L. performed little range of motion during knee flexion of the prosthetic limb, and on unstable surfaces such as ramp and ladder, walked with bilateral support on handrail and trunk posteriorization, pulling body with upper limbs - MMSS in the ascent and little control of knee locking. For this, gait training was performed, aiming at autonomy and independence in compromised ADLs.

Gait is a style of walking and is divided into three respective phases: support phase, balancing phase and double support phase. In gait training, the phases of the gates are developed for the body to get used to and learn to use the prosthesis without obstacles, providing an adequate ambulation (DIAS, et. al, 2014).

In the initial training, the patient performed the gait, with prosthesis and Canadian crutches and/or with walkers, presenting anterior trunk, reduced speed, variable step length and shorter support time. In addition, the training of walking using the prosthesis also aimed to develop the ability to go up and down, up and down a steep terrain, to get in and out of a car, the ability to sit and get up from a high chair and a low one.

The prosthetization became fundamental for a complete post-amputation rehabilitation, in order to favor functionality and autonomy in ADLs and Activities and Instruments of Daily Living – IADL, as well as to promote gait in a functional and adequate way (MATOS, 2019).

Varoto (2021) reports that the adaptation of the prosthesis is not the only important factor, but a favorable functional recovery after an amputation depends on the stump, postural balance, safety with the prosthesis, amputation time, comorbidities and age of patients and their engagement in gait training. Walking and climbing stairs are the most difficult ADLs for people with lower limb amputation. In this context, in the final training, one can observe improvement in gait speed, reduction in cadence, increase in stride, reduction in energy expenditure and reduction in dependence on the walker and the use of two Canadian crutches, starting to use only one.

5 CONCLUSIONS

The amputation comes to cause occupational limitations to the individual in such a way that it can bring losses of biopsychosocial level, where it is observed the need for structured public policies and qualified multidisciplinary team in order to reduce to the maximum the damages of amputation present in patients.

The indication of prosthesis for this public should not be generalized, being necessary the knowledge of the factors that interfere in the prosthesis and in the use of the prosthesis, considering cost-benefit, to carry out a rehabilitation more adequate to the subjectivity and individualities of the patients. A careful evaluation should be made by the multidisciplinary team, especially by the Occupational Therapist before starting rehabilitation taking into account previous functional capacity and occupational history, among other factors.

Rehabilitation programs for amputees are not simply prosthetic services, but must take into account the patient as a whole in their goals and ambitions. Thus, the intervention of the occupational therapist is to promote well-being and quality of life to people who have suffered lower limb amputation, through guidance, care, preparations, training and use of assistive technologies to assist in the autonomy and independence of the daily activities of amputees.

REFERENCES

AMERICAN OCCUPATIONAL THERAPY ASSOCIATION, A. Estrutura da prática da Terapia Ocupacional: domínio & processo - 3ª ed. traduzida. Revista de Terapia Ocupacional da Universidade de São Paulo, [S. l.], v. 26, n. esp, p. 1-49, 2015. DOI: 10.11606/issn.2238-6149.v26iespp1-49. Disponível em: https://www.revistas.usp.br/rto/article/view/97496. Acesso em: 08 nov. 2022.

BRASIL. Ministério da Saúde. Centro de Amputados - Orientação a Pacientes - Membro Inferior. Rio de Janeiro: Instituto Nacional de Taumatologia e aortopedia, 2018. Disponível em: https://www.into.saude.gov.br/folhetos-e-cartilhas-para-o-paciente/cartilhas/353-centro-de-amputados-orientacao-a-pacientes-membro-inferior.

DIAS, C. S., et. al. Efeitos de programa de reabilitação em regime de internação em paciente amputado transfemoral unilateral: relato de caso. Acta Fisiatr, v. 28, n. 4., 2014. Disponível em: https://www.revistas.usp.br/actafisiatrica/article/view/192612. Acesso em 09 nov. 2022.

GOMES, D. et al. Enquadramento da prática da Terapia Ocupacional: Domínio & Processo – 4ª ed. Versão Portuguesa de Occupational Therapy Pratice Framework: Domain and Process 4th Edition (AOTA – 2020). Leiria - Portugal: Politécnico de Leiria, 2021. Disponível em: https://iconline.ipleiria.pt/handle/10400.8/6370. Acesso em: 10 nov. 2022.

JESUS-SILVA, S. et. al. Análise dos fatores de risco relacionados às amputações maiores e menores de membros inferiores em hospital terciário. J Vasc. Bras. v. 16, n. 1, 2017. Disponível em: https://www.scielo.br/j/jvb/a/9VsQsy7z4dLVZvVdPZysCbR/abstract/?lang=pt. Acesso em: 07 nov. 2022.

KOLOSSVÁRY, E. et. al. Trends in major lower limb amputation related to peripheral arterial disease in hungary: a nationwide study (2004-2012). Eur J Vasc Endovasc Surg. v. 50, 1ª ed., 2015. Disponível em: https://www.sciencedirect.com/science/article/pii/S1078588415001197. Acesso em: 07 nov. 2022.

MATOS, D. Reabilitação e qualidade de vida em pessoas com amputação de membros inferiores. 2019. 275 f., il. Tese (Doutorado em Psicologia Clínica e Cultura) —Universidade de Brasília, Brasília, 2019. Disponível em: https://repositorio.unb.br/handle/10482/37154. Acesso em: 07 nov. 2022.

NEGRETTI, P. et. al. Percepção de pessoas amputadas de membros inferioes quantoao uso de tecnologia assistiva. Revista Univap. v. 25, n. 48, 2019. Disponível em: https://www.researchgate.net/publication/337800291_PERCEPCAO_DE_PESSOAS_AMPUTADAS_DE_MEMBROS_INFERIORES_QUANTO_AO_USO_DE_TECNOLOGIA_ASSISTIVA. Acesso em: 08 nov. 2022.

RODRIGUES JÚNIOR, et. al. Impressora 3D no desenvolvimento de pesquisas com próteses. Rev. Interinst. Bras. Ter. Ocup. v. 2, n. 2., 2018. Disponível em: https://revistas.ufrj.br/index.php/ribto/article/view/15022/pdf. Acesso em: 09 nov. 2022.

TROMBLY, C. A.; RADOMSKI, M. V. Terapia Ocupacional para Disfunções Físicas. 13.ed. São Paulo: Santos Editora, 2013.

VAROTO, Ariane Stephany Araujo Rocha. O impacto da reabilitação protetica na capacidade e desempenho funcional de idosos com amputação de membros inferiores: uma revisão narrativa. 2021. Monografia (especialização) – Universidade Federal de Minas Gerais, Escola de Educação Física, Fisioterapia e Terapia Ocupacional. 2021.

SEVEN publicações acadêmicas

Antithrombotic agent's effects in thrombotic events caused by Covid-19: A systematic review

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ABSTRACT
There is an association between COVID-19 and an increased risk of thrombotic events. However, the incidence of such events changes due to the severity of the disease. The aim of this paper was to evaluate the effects of antithrombotic agents on thrombotic events caused by COVID-19. This is a systematic review, with descriptive qualitative evaluation, carried out between 05/28/2021 and 06/21/2021. Scientific articles were searched, from 2019 to 2020, in SciVerse Scopus, Web of Science, PubMed and SCIELO databases. As a result, it was possible to observe that the most commonly used drugs for prophylaxis, and therapeutic of thrombotic events, in patients with COVID-19 were low molecular weight heparin, unfractionated heparin, fondaparinux, oral anticoagulants, antiplatelet agents, argatroban, aspirin, rosuvastatin, vitamin K antagonists, alteplase and other unspecified oral anticoagulants, used in monotherapy or associated. The proposed therapeutic schemes are a variation of the dosage of the drugs used. The use of therapeutic dose (tAC) and prophylactic dose (pAC); tAC, pAC and intermediate dose (iAC); pAC and subtherapeutic dose (subtAC); pAC, subtAC, therapeutic dose of antiplatelet (tAP) and prophylactic dose of antiplatelet (pAP) were found. The drugs used, with the exception of aspirin, showed some type of beneficial response in the recovery of the patient with COVID-19. The best treatment used was therapeutic dosing with enoxaparin, argatroban, fondaparinux and oral anticoagulants. According to the articles evaluated in this review, promising results of the use of antithrombotic agents in C0VID-19 are observed, but more studies are needed.

Keywords: SARS-CoV-2, COVID-19, antithrombotic therapy, antiplatelet therapy.

1 INTRODUCTION

The SARS-COV-2 virus, which is responsible for causing severe acute respiratory syndrome, is composed of a single stranded positive RNA molecule (RNA+) containing approximately 30,000 nucleotides and is the etiologic agent of coronavirus 2019 (COVID-19) disease (Ceraolo & Giorgi, 2020). SARS-COV-2 belongs to the family Coronaviridae, which bears much similarity to the virus

that caused the 2003 SARS outbreak, named, SARS-COV (Benvenuto, 2020). Since its emergence in the city of Wuhan in China in December 2019, COVID-19 has spread rapidly throughout the world, and was considered a pandemic by the World Health Organization (WHO) in March 2020 (PAHO, 2020).

Its severity is very variable, with some infected patients being asymptomatic, or having mild symptoms related to the upper respiratory tract; in other cases, the disease may progress to a viral pneumonia with acute respiratory distress syndrome, multiple organ dysfunction and evolve to death (Zhou et al., 2020). According to Morales et al. (2020), the most common symptoms presented in COVID-19 are cough, fever, and dyspnea. At the onset of the disease, depending on the individual, one may observe myalgia, asthenia, productive cough, headache, dizziness hemoptysis, and gastrointestinal symptoms that can occur even if there are no respiratory manifestations (Huang et al., 2020).

Symptoms arising from complications of COVID-19 are respiratory failure, cardiac, hepatic and renal damage, as well as arrhythmias, coagulopathies, shock and secondary infections (Gouveia & Campos, 2020). They may also present with bilateral pneumonia, systemic inflammation, endothelial dysfunction, and coagulation activation (Longhitano et al., 2020). Some studies have shown an incidence of venous thromboembolic events in patients with COVID-19 (Pancani et al., 2021). Pereira et al. (2021), in a literature review, noted platelet changes, which presented with thrombocytopenia and thrombocytosis. Regarding the alteration in platelet morphology, changes were observed in the blood smear, where the presence of giant platelets were found, being mostly hyperchromatic and vacuolized, with the presence of megakaryocytes, and also large platelet clusters (Pereira et al., 2021).

Activation of coagulation is considered a very important distinctive clinical feature in patients affected by the more severe forms of the disease (Spiezia et al., 2020). Higher rates of venous thromboembolic events have been found to be present in patients with COVID-19 (Helms et al., 2020; Klok et al., 2020 & Middeldorp et al., 2020). The reported incidence of thrombotic events varies depending on disease severity and thromboprophylaxis strategies (Pancani et al., 2021). In addition, disseminated intravascular coagulation (DIC) is correlated with increased mortality rates in COVID-19 (Batschauer & Jovita, 2020).

Patients with COVID-19 often have coagulation disorders, especially those who develop the severe form of the disease. Through a multicenter retrospective study done in the first two months of the epidemic, 46.4% of patients with confirmed infection had D-dimer values (0.5 mg/L), with higher results observed in more severe cases (Middeldorp et al., 2020). Also, according to the elevation of D-dimer levels, another study demonstrated its increase along with prolonged prothrombin time (PT) and decreased fibrinogen and platelets. It was reported in patients who did not survive, some ischemic

changes such as ecchymosis of fingers, toes and worsening of cardiovascular and renal function (Li, Lu & Zhang, 2020).

Other markers were also measured, such as activated partial thromboplastin time (APTT), fibrinogen, antithrombin III (AT III) and fibrin degradation products (FDPs). Significantly higher levels of FDPs, as well as longer APTT, were recorded in the non-survivors' group when compared with the survivors' group. In addition, both fibrinogen and AT III had significantly lower levels. Such findings are suggestive for activation of coagulation and deregulated generation of thrombin and fibrinolysis. DIC was reported in most deaths of patients with COVID-19. Individuals, who develop virus infection, may experience sepsis associated with organ dysfunction. (Tang, Li, Wang & Sun, 2020).

As for anticoagulant therapy, the use of Low Molecular Weight Heparin (LMWH) is considered in all cases of COVID-19, even in non-critical cases, although there are contraindications due to the possibility of bleeding associated with low platelets. Anti-inflammatory properties of heparin have been described as beneficial in SARS-CoV-2 infections, in which pro-inflammatory cytokines are extremely elevated, leading to improvement with better prognosis and decreased mortality (Batschauer & Jovita, 2020; Tang, N & Thachil, 2020).

Because COVID-19 is a recent and serious infectious disease, many studies are needed in order to bring reliable data, to make more appropriate therapeutic conducts, since there is still no specific treatment. It seems that Venous Thromboembolism (VTE) is a very frequent complication associated with more severe cases of COVID-19. The use of LMWH in prophylactic and therapeutic doses after hospital discharge has shown clinical improvement and low risk of bleeding complications. That said, there is a high risk of patients developing VTE in COVID-19, and the heparin administration, with its various dosing options, should be performed aggressively in patients who are not at high risk of bleeding, especially in patients with multiple risk factors such as obesity, diabetes, and cancer (Rossi, 2020). The administration of therapeutic doses is not proven by evidence in patients who have not been diagnosed with thromboembolism or who do not require extracorporeal membrane oxygenation. The risk-benefit ratio still needs to be better analyzed in prospective studies before deciding on a more aggressive anticoagulation approach (Joly, Siguret & Veyradier, 2020). Within this context, several studies have already confirmed how beneficial anticoagulant use is in reducing the risk of these complications and contributing positively to patient survival (Aghajani et al., 2021).

Recently, statins are being used as an alternative in the treatment of COVID-19. Although their traditional use is employed in the treatment of serum cholesterol lowering, their anti-inflammatory and antithrombotic properties in the treatment of COVID-19 have drawn attention. Statins appear to have the potential to decrease both the impact of myocardial injury and thrombotic events correlated with the more severe forms of COVID-19 (Bikdeli, Madhavan & Gupta et al., 2020). According to a single

cohort longitudinal study, dyslipidemia may act as a protective factor for pulmonary embolism (PE). Patients without cardiovascular risks recorded in their medical records had a nine times higher risk for PE when compared to patients with dyslipidemia. The hypothesis behind this, would be that patients previously treated with statins, showed a potential benefit, due to the immunomodulatory action or preventing cardiovascular damage (Gomez et al., 2021).

COVID-19 is associated with intense inflammation and a pro-thrombotic state that leads to a poor prognosis, resulting in an increase in FDPs as well as D-dimer, with possible thromboembolic events in the venous and arterial circulation. These findings relate to the great association between thrombotic and inflammatory events, since coagulation factors and platelets act directly in modulating the host immune response, leading to pro-inflammatory events that are independent of hemostatic effects. Therefore, the systematization of evidence on the use of anticoagulants and antiplatelet agents in thromboembolic events in patients with COVID-19 is justified and relevant. Thus, the objective of this work was to perform a systematic review on the effects of anticoagulants and antiplatelet agents in thrombotic events caused by COVID-19.

2 METHODOLOGIES

This work consisted of a systematic review regarding the topic "effect of anticoagulants and antiplatelet agents on COVID-19 thrombotic events", performed between 05/28/2021 and 06/21/2021, by searching for original and experimental scientific articles, published in English, from 2019 to 2020, in the SciVerse Scopus, Web of Science, PubMed and Scientific Electronic Library Online databases. The following were used as descriptors: "COVID-19" or "SARS-CoV-2" or "coronavirus" or "severe acute respiratory syndrome coronavirus 2" or "2019 new coronavirus" or "2019 novel coronavirus" or "2019-nCoV" AND "anti-coagulants" or "anti-coagulant" or "antithrombotic" or "antithrombotics" or "antithrombotic therapy" or "antithrombotic treatment" or "antithrombotics therapy" or "antithrombotics treatment "or "anti-coagulant treatment" or "anti-coagulant therapy" or "anti-coagulants treatment" or "anti-coagulants therapy" or "antiplatelet" or "antiplatelets" or "antiplatelet treatment" or "antiplatelets treatment" or "antiplatelet therapy" or "antiplatelets therapy". The inclusion of the article in this review was performed according to the previously established eligibility criteria: original and experimental scientific articles, published in the English language, period from 2019 to 2020, considering a combination of relevant aspects to answer the main objective of the review, described below.

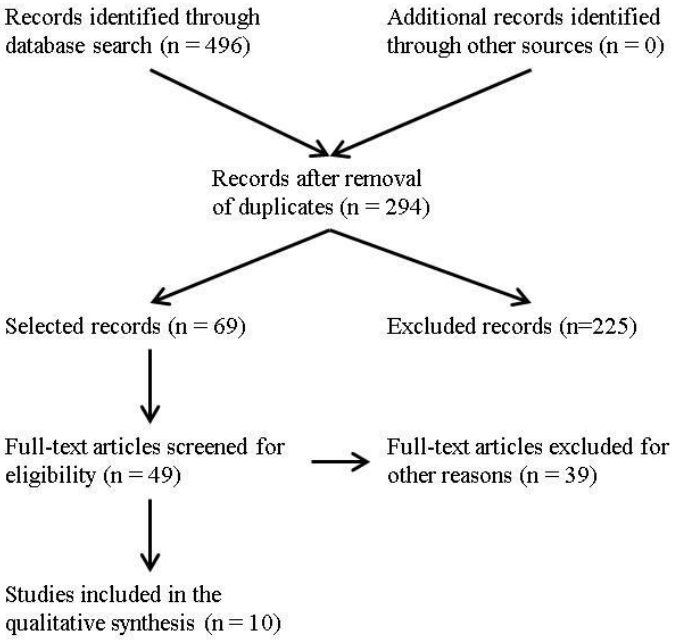
Systematic reviews, narrative reviews, integrative reviews, meta-analysis, book chapters, event abstracts, case reports, editorials, and opinion articles were excluded. Sequentially, the articles obtained were selected for the reading of the title and abstract, and should have contained terms and subject matter related to the effect of anticoagulants and antiplatelet agents on COVID-19 thrombotic

events. Subsequently, the articles that met the inclusion and exclusion criteria were read in full with data extraction. This systematic review had a descriptive qualitative evaluation. To avoid bias, the selections of articles and data extraction were carried out independently by three reviewers, with a subsequent consensus meeting to resolve discrepancies. The systematic review followed the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses PRISMA (Page, et al. 2021).

3 RESULTS AND DISCUSSION

At the time of this systematic review, with the search and selection of articles made through scientific databases, 496 articles were found referring to the proposed theme (Figure 1).

Figure 1. Search process and article selection, via databases.



After all the criteria were applied, only 10 scientific articles were catalogued, because they faithfully followed the objective of the work. The remaining articles were excluded for not meeting the study objective and for fitting the exclusion criteria. The articles reviewed and that met the inclusion criteria are listed in Table 1, 2, 3 and 4.

In the 10 articles selected for this review, a predominance of patients aged over 55 years diagnosed with COVID-19 was observed (Table 1). The main comorbidities found in these patients were hypertension, diabetes, obesity, hyperlipidemia, chronic obstructive pulmonary disease (COPD), and asthma. According to the Centers for Disease Control and Prevention (CDC, 2021), elderly people are more likely to develop severe complications and/or die from COVID-19. Souza et al. (2021) conducted a study regarding deaths from COVID-19 in Brazil and the most recorded comorbidities were heart disease (40.1%), diabetes (28.4%), obesity (10.3%), neurological diseases (5.0%), kidney

diseases (4.7%), and pneumopathies (4.5%). According to Singh et al. (2020), patients who have diabetes, hypertension, cardiovascular and cerebrovascular diseases, COPD, and cancer were associated with an increased risk of having more severe symptoms of COVID-19, with people with cerebrovascular diseases, COPD, and cancer having a higher risk of mortality. Also, in the present review, it was found that the majority of hospitalizations were male with 7,141 patients, while female patients were 6,722. The length of hospitalization ranged from 13 to 74 days, with a mean of 44.3 days.

Table 1 – Demographic data of the studies

Author	Sample size (n)	Sample age	Sample gender	Hospitalization (days)	Comorbidities
Cardillo et al. 2021.	N = 100 patients	< 40 years: 9 (9%) 40 - 60 years: 51 (51%) ≥ 60 years: 53 (53%)	♀: 37 (37%) ♂: 63 (63%)	02/18/2020 to 04/30/2020 (73 days)	Unreported
Ionescu et al. 2021.	N=3,717 patients	average age: 64.5 years	♀: 1,792 (51.5%) ♂: 1,688 (48.5%)	03/13/2020 to 05/05/2020 (54 days)	hypertension, hyperlipidemia, coronary artery disease, peripheral arterial disease, heart failure, stroke/transient ischemic attack, atrial fibrillation, chronic kidney disease grade 3 or higher, hemodialysis dependence, history of malignancy, history of venous thromboembolism, immunocompromised state, connective tissue disease, chronic lung disease
Friedrich et al. 2020.	N=31 patients	average age: 60 ± 15 years	♀: 10 (32%) ♂: 21 (68%)	04/06/2020 to 05/13/2020 (38 days)	cardiovascular, pulmonary, diabetes, renal, obesity, coagulation disorders, neoplasm
Sahai et al. 2021.	N= 1,936 patients	Unreported	No aspirin ♀: 847 (51.3%) ♂: 804 (48.7%) Aspirin ♀: 113 (39.6%) ♂: 172 (60.4)	03/13/2020 to 05/13/2020 (62 days)	hemodynamic instability; COPD; asthma; diabetes; hypertension; coronary artery disease; heart failure; cancer; history of immunosuppressive treatment transplantation; multiple sclerosis; connective tissue disease; inflammatory bowel disease; immunosuppressive disease
Frohlich et al. 2021.	N= 6,637 patients	< 60 years (31.8%) 60-69 years (16.9%) 70-79 years (20.9%) 80-89 years (25.2%) ≥90 years (5.3%)	♀: 3,132 (47.2%) ♂: 3,505 (52.8%)	02/01/2020 to 04/15/2020 (75 days)	hypertension, renal failure, diabetes, atrial fibrillation, heart failure, pulmonary circulatory disorders
Giannis et al. 2021.	N = 146 patients (118 VTE)	18–59 years: 43.2% 60-75 years: 26.7% >75 years: 30.1%	♀: 52 (35.6%) ♂: 94 (64.4%)	03/01/2020 to 04/27/2020 (58 days)	hypertension, diabetes, hyperlipidemia, chronic lung disease (asthma and COPD), coronary artery disease, heart failure, chronic kidney disease/end-stage renal disease, chronic liver disease, cancer, peripheral arterial disease/peripheral vascular disease; cerebrovascular disease; prior history of VTE

Li et al. 2021.	N= 1,125 patients	Average age: 58.3 years	♀: 564 (50.1%) ♂: 561 (49.9%)	21 (± 13) days	hypertension, diabetes; coronary artery disease
Pesavento et al. 2020.	N= 324 patients	average age: 71 years	Prophylactic Dose (N = 240): ♀: 110 (45.8%) ♂: 130 (54.2%) Sub therapeutic Dose (N = 84): ♀: 33 (39.3%) ♂: 51 (60.7%)	02/26/2020 to 04/06/2020 (41 days)	obesity, cancer, venous insufficiency, personal or family history of VTE, known thrombophilia, or continuous treatment with hormonal or antipsychotic drugs
Escalard et al. 2020.	N = 10 patients	COVID-19: average age: 59.5 years non COVID-19: average age: 72 years	♀: 2(20%) ♂: 8(80%)	03/01/2020 to 04/15/2020 (46 days)	hypertension, diabetes; hypercholesterolemia
Longhitano et al. 2020.	N= 74 patients	average age: 68.6 years	ICU ♀: 3 (16.6%) ♂: 15 (83.3%) Non-ICU ♀: 27 (48.2%) ♂: 29 (51.8%)	05/18/2020 to 05/30/2020 (13 days)	atrial fibrillation, chronic renal failure, obesity, diabetes, cardiovascular disease, COPD, asthma, cancer.

The main thrombotic outcome reported was VTE, reported by 6 (66.6%) of the 10 studies, these being: Cardillo et al. (2021); Ionescu et al. (2021); Sahai et al. (2021); Giannis et al. (2021); Pesavento et al. (2020); Longhitano et al. (2020). The next most reported outcome was Deep Vein Thrombosis (DVT), cited by 5 (55.5%): Friedrich et al. (2020); Frohlich et al. (2021); Giannis et al. (2021); Li et al. (2021) and Longhitano et al. (2020). PE was cited by 5 (55.5%): Friedrich et al. (2020); Frohlich et al. (2021); Giannis et al. (2021); Li et al. (2021) and Longhitano et al. (2020). Other events, such as stroke, acute myocardial infarction (AMI), myocarditis, pulmonary edema, gastrointestinal tract bleeding, intracranial hemorrhage, and transient ischemic attack, have also been reported (Table 2, 3, 4). All events are observed in patients who were using some antiplatelet and/or antithrombotic drug during hospital stay, either in the prophylaxis or therapy.

Table 2: Data regarding the study type and objective in COVID-19.

Author	Study type	Study objective
Cardillo et al. 2021.	Retrospective cohort	To evaluate the antithrombotic and anti-inflammatory effects of fondaparinux and enoxaparin in patients with COVID-19 according to selected laboratory markers in the FONDENOXAVID study.
Ionescu et al. 2021	Retrospective multicenter cohort analysis	To evaluate the impact of using different doses (therapeutic and prophylactic) of anticoagulant on survival in patients with COVID-19.
Friedrich et al. 2020	Single-center retrospective study	To investigate coagulation markers and the incidence of thromboembolic events in COVID-19 patients receiving anticoagulants.
Sahai et al. 2021	Cohort, retrospective studies conducted by consulting medical records	To determine whether the antiplatelet effect of aspirin can reduce the risk of myocardial infarction, stroke, and venous thromboembolism in patients with COVID-19.
Frohlich et al. 2021	Retrospective cohort	To investigate the impact of long-term concomitant use of ACE inhibitors and oral anticoagulant, on clinical outcomes in hospitalized patients with COVID-19.
Giannis et al. 2021	Retrospective cohort	To identify the incidence of VTE and mortality in patients with initial presentation of COVID-19.
Li et al. 2021	Retrospective cohort	To investigate the prevalence of systemic thromboembolism, venous thromboembolism, bleeding and mortality in relation to underlying risk factors and also to evaluate the impact of anticoagulation use in hospitalized patients with COVID-19.
Pesavento et al. 2020	Retrospective cohort	To assess the incidence of relevant bleeding complications in association with the antithrombotic strategy.
Escalard et al. 2020	Experience report	To describe the initial experience treating patients with COVID-19 presenting with acute ischemic stroke due to large vessel occlusion during the first 6 weeks of the COVID-19 outbreak.
Longhitano et al. 2020	Prospective and observational study	To evaluate the thrombotic risk in COVID-19 patients presenting with pneumonia and acute respiratory failure and compare populations treated with three different antithrombotic prophylaxis protocols.

The most commonly used drugs were unfractionated heparin (UFH), LMWH (enoxaparin, fondaparinux), antiplatelet agents (aspirin), direct thrombin inhibitors (argatroban), oral anticoagulants such as Vitamin K Antagonist (VKA), as well as other direct oral anticoagulants (DOACs) not specified in the study, fibrinolytics (alteplase) and Statins (Table 3).

Table 3: Data regarding the therapy employed in COVID-19.

Author	Thrombotic event (*1)	COVID-19 Medication (*2)	Anticoagulant/antithrombotic medication (*3)
Cardillo et al. 2021	VTE	AB; IB; ES; IM NSAIDs; ACF	Enox - 40 mg or 60 mg 1x day (n=62); ♂: 40 (65%) ♀: 22 (35%) Fond – 2.5 mg 1x day (n=38); ♂: 23 (61%) ♀: 15 (39%)
Ionescu et al. 2021	TIA; VTE	COR; HQ; AZ; HQ+ AZ	tAC (28,7%) - (a) UFH; (b) Enox s.c. - 1 mg / kg, 2x day or 1,5 mg / kg, 1 x day; (c) i.v. ARG infusion; (d) Fond s.c. 5-10 mg 1x day; (e) OAC prescribed before and continued during hospitalization pAC (60,9%) - a) UFH 5,000 units 1x or 2x day; Enox injection s.c. daily in doses of 30-40 mg 1x day; or Fond s.c. 2.5 mg 1x day Not receiving anticoagulant (non-AC) (10.4%)
Friedrich et al. 2020	PE, DVT	NI	Therapy without dosage - ICU patient on heparin (16%); LMWH: therapeutic and prophylactic (6%); ARG used in patients with heparin-induced thrombocytopenia (6%); No anticoagulation (13%)

Sahai et al. 2021	CVA, AMI, VTE	NI	Aspirin 81mg and patients treated with NSAIDs
Frohlich et al. 2021	AMI, MIO, PE, TVP, PEd, CVA, Patients requiring Hemofiltration	ACEI, ARB, MRA, CCB, BB, statins and diuretics (different from MRA), insulin and non-insulin antidiabetics, IMS.	VKA, DOAC, ANP Dosage: NI
Giannis et al. 2021	VTE, PE, DVT	HQ in 41.1%, COR in 22.6%, Statins in 21.2%, AZ in 19.2%	Dosage= NI antiplatelet agents in 20.6%, anticoagulants in 20.6% (with 14.4% at tAC and 6.2% at pAC)
Li et al. 2021	DVT, PE, CVA, BGIT, IHC	antiviral (70%); ARB (62.5%); RIBV (17.3%); LOP/RIT (5.8%); CLOP (3.8%); GAN (2.6%); REM (0.1%); GLICO (18%)	OAC (7.7%); ACONAK (7.3%); VFA (0.4%); ACP (18.6%); LMWH (9.9%); heparin (9.2%); OAC+ACP (4.2%); Asp (6.8%) CLO (4.4%); Others (0.1%) Asp+CLO (1,9%); heparin+ LMWH (0,4%)
Pesavento et al. 2020	VTE	Prophylactic dose (n = 240) - LOP/RIT (17.5%); HQ (75%); TZM (2.5%); REM (0.4%); AB (70.8%); ES (32.1%); IBP (64.2%) Sub Therapeutic dose (n = 84) - LOP/RIT (25.0%); HQ (84.5%); TZM (16.7%); REM (2.4%); AB (67.9%) ES (32.1%); IBP (81.0%)	pAC (n= 240) - UFH 5000 U (0.4%); LMWH 40 mg OD (80.8%); Fond 2.5mg (18.8%) subtAC (n=84) - LMWH 40 mg OD (92.9%); Fond 7.5 mg (7.1%) pAP (n=240) – none (77.5%); SAPT (20.8%); DAPT (1.7%) subtAP (n=84) – none (78.6%); SAPT (20.2%); DAPT (1.2%)
Escalard et al. 2020	CVA	NI	Five patients (50%) were treated with intravenous alteplase, in a mean time of 175 minutes. All 10 patients were treated with mechanical thrombectomy, all procedures were started within 6 hours of stroke onset. Drug treatments with antiplatelet and neutrophil extracellular traps targeting were used, but not described.
Longhitano et al. 2020	VTE, PE	NI	pAC (34.5%) - Enox: 80U/kg /day (29.7%); heparin 5000UI (5.4%); Fond 2.5 mg /day (1.4%) Highest dose prophylaxis (intermediate and therapeutic) (63.5%) Intermediate dose (32.4%) – Enox <200 and >80 U/kg /day (29.7%); heparin >15000 and < 25000 U/kg /day (1.4%); Fond 5mg/24h (1.4%) tAC (31.1%) - Enox 100 U/kg (9.5%); heparin 12500 U (21.6%)

(*1) (VTE): Venous thromboembolism; (TIA): Transient ischemic attack; (PE): Pulmonary embolism; (DVT): Deep vein thrombosis; (CVA): Cerebrovascular accident; (AMI): Acute myocardial infarction; (VT): Venous thrombosis; (PEd): Pulmonary edema; (MIO): Myocarditis; (BGIT) Bleeding of the Gastrointestinal Tract, (ICH) Intracranial hemorrhage.
(*2) (AB) Antibiotics; (IB) Immunobiologics, (AV) Antivirals; (ES) Steroids; (IM) Immunomodulator; (NSAIDs) Nonsteroidal anti-inflammatory drug; (ACF) Acetominophen; (COR) Corticosteroid; (HQ) Hydroxychloroquine; (AZ) Azithromycin; (HQ+AZ) Hydroxychloroquine + azithromycin; (NI) not informed, (REM) Remdesivir; (FAV) Favipiravir; (LOP/RIT) Lopinavir/Ritonavir; (ATA/RIT) Atazanavir/Ritonavir; (int.d) intermediate dose; (st.d) standard dose; (ACEI) angiotensin-converting enzyme inhibitors; (ARB) angiotensin receptor blocker; (MRA) mineralocorticoid receptor antagonist; (CCB) calcium channel blockers; (BB) beta blockers; (IMS) immunosuppressants; (Asp) Aspirin; (VFA)

warfarin; (TZM) Tocilizumab; (IBP) proton pump inhibitors; (ARB) Arbidol; (RIBV) Ribavirin; (CLOP) Chloroquine phosphate; (FOS) Phosphate; (CLO) Chloroquine; (GAN) Ganciclovir; (GLICO)Glucocorticoids.
(*3) (Enox): Enoxyparin; (Fond): Fondaparinux; (tAC): Therapeutic anticoagulant dose; (ARG) argatroban; (pAC): Prophylactic anticoagulant dose; (s.c.): subcutaneous; (i.v.) intravenous; (OAC) oral anticoagulants: warfarin, apixaban, rivaroxaban, dabigatran; (ICU): Intensive care unit, (LMWH): Low molecular weight heparin; (IRAA) Renin-angiotensin-aldosterone system inhibitors, (TZM) Tocilizumab; (int.d) intermediate dose; (st.d) standard dose, (IRP - ADP P2Y12) platelet receptor inhibitors, (VKA) vitamin k antagonist, (ANP) antiplatelet, (DOAC) direct oral anticoagulants; (UFH) unfractionated heparin; (OD): once daily; (BID): twice daily; (SAPT) single antiplatelet therapy; (DAPT) dual antiplatelet therapy; (ACONAK) oral anticoagulant not vitamin k antagonist; (VFA) warfarin; (ACP) parenteral anticoagulant; (CLO) Chloroquine; (Asp) Aspirin; (subtAC): sub Therapeutic anticoagulant dose; (pAC): Prophylactic anticoagulant dose; (subtAP): sub Therapeutic antiplatelet dose; (pAP): Prophylactic antiplatelet dose

Table 4: Data regarding the outcomes of the therapy employed in COVID-19.

Author	Outcomes of treatment for thromboembolic diseases	Conclusion
Cardillo et al. 2021.	No significant differences were observed between patients on prophylaxis with enoxaparin (Enox) or fondaparinux (Fond), regarding clinical characteristics. In the analysis of D-dimer, fibrinogen, CRP, LDH and IL-6 markers, on the day of admission and three weeks thereafter, the following results were observed: A progressive reduction of D-dimer: occurred in both groups Enox or Fond. However, there was no statistical difference between the two in relation to D-dimer, although treatment with Enox was more effective in this reduction. When assessing fibrinogen, no statistical difference was observed, both drugs Enox and Fond showed no effect on this marker. Regarding CRP it was observed that Enox (HL >0) was not effective in reducing this marker, but Fond (HL<0) was able to reduce it. Both drugs (Enox; Fond) were effective in reducing Lactate dehydrogenase (LDH) Both drugs (Enox; Fond) were effective in reducing Interleukin-6 (IL-6)	In conclusion the anti-inflammatory effects of fondaparinux and enoxaparin after 3 weeks of prophylactic treatment were similar when considered the levels of fibrinogen and D-dimer, LDH and IL-6. Regarding CRP, Fondaparinux was more effective. Furthermore, it is important to emphasize that no statistical differences were observed in relation to clinical characteristics
Ionescu et al. 2021	After 25 days of admission, different survival probabilities were observed when comparing patients receiving tAC with those who received only pAC in both populations (ICU and non-ICU) -ICU (56.3% vs 22.5%) - non-ICU (78.5% vs 65.7%). pAC was associated with a 65% reduction in the risk of death and tAC was associated with an 86% decreased risk of death. Anticoagulants use: 90% of patients - 2/3: prophylactic doses; 1/3: therapeutic doses Hemorrhagic events in 147 patients: 81% of the patients with tAC doses, 5.5% without anticoagulante and 2.3% with pAC doses Severe thrombocytopenia: 3.4% in the tAC group, 2.8% in the no anticoagulant group, and 1.3% in the pAC group	According to this cohort study, there is a strong association between anticoagulant treatment and reduced mortality. The greatest impact was observed in patients who were critically ill. However, a benefit was also noted in patients outside the ICU.
Friedrich et al. 2020	Fibrinogen: Mean value 6.4± SD 1.8g/l, with a peak at the third week of disease and no significant decrease over time. D-dimer: Mean value 5.1±4.4mg/l with a peak of 6.8±5.3mg/l at the fourth week of illness, and a subsequent decrease. In the ICU patients, the d-dimer value was higher. Platelets and Prothrombin time: showed no significant changes over time.	Changes in coagulation were observed in patients with COVID-19, with the presence of hypercoagulability, peaks in coagulation marker dosages are observed in the third and fourth week, even with the use of antithrombotic agents. This increase in coagulation markers may indicate the need to increase the timing of thromboprophylaxis in critically ill patients or those with prothrombotic risk factors.

	Thromboembolic events were diagnosed in 13% of patients and 16% of patients died during the observation period.	
Sahai et al. 2021	There was no statistical difference in relation to mortality in patients treated with aspirin or not. There was no statistical difference in patients treated with aspirin or not in relation to events such as acute myocardial infarction and venous thromboembolism. However, the use of aspirin was associated with the incidence of stroke. In addition, in patients treated with NSAIDs or not, the incidence of acute myocardial infarction, venous thromboembolism and stroke was not significant and the mortality was not different in patients treated with aspirin in relation to those treated with other NSAIDs.	It is suggested that low-dose aspirin does not protect against thrombotic events or deaths in patients diagnosed with COVID-19. The use of traditional antiplatelet agents, does not protect against thrombotic events or mortality in COVID-19 and may cause harm.
Frohlich et al. 2021	The multivariable model demonstrated that therapy: direct oral anticoagulants (DOAC) associated with vitamin K antagonist (VKA) were the therapy related to thrombotic event reduction. Antiplatelet (ANP) use was not associated with a reduction in thrombotic events.	Antithrombotic therapy with VKA or DOAC, except ANP therapy, showed better results. There is a need for retrospective randomized studies to confirm this result.
Giannis et al. 2021	Venous thromboembolism (VTE) was diagnosed in 1.09% of patients, pulmonary embolism in 0.93%, and deep vein thrombosis in 0.16%. Statin and antiplatelet use was associated with reduced VTE and mortality.	The study showed the incidence of thrombotic events in patients with COVID-19 and a relationship between the use of statins and antiplatelet agents and the reduction of VTE and mortality. Based on these results, there is a need to study the possible benefits of antithrombotic agents in COVID-19 patients in prehospitalization, especially in patients who have cardiovascular or thrombotic risk factors.
Li et al. 2021	Oral and parenteral anticoagulants are associated with reduced thromboembolism over a 21-day interval, as well as reduced risk of death.	Patients diagnosed with COVID-19 have a high risk for thromboembolic and bleeding events, associated with a high mortality rate. Therapy with anticoagulants, especially parenteral ones, considerably decreased the risk of outcomes containing such events.
Pesavento et al. 2020	Major bleeding complications among patients taking (under) therapeutic doses greatly exceeded those of patients treated with preventive doses.	As for thrombotic events, the incidence of major or relevant bleeding complications during hospitalization was considerably higher in patients treated with therapeutic dose medication than in those who received prophylactic doses of antithrombotic medications.
Escalard et al. 2020	40% of the patients had proximal artery reocclusion, even though they were using anticoagulation. 90% of patients had successful recanalization. 60% of the patients died during hospitalization. Most patients (70%) had mild or absent respiratory symptoms at the time of stroke. This suggests that there is no correlation between the severity of respiratory symptoms and the risk of acute ischemic stroke with large vessel occlusion.	Although the study results require further confirmation, pharmacological approach such as the use of antiplatelet or other antithrombotic therapy should be investigated to take into account inflammatory and coagulation disorders associated with COVID-19. Therefore, this study does not agree that COVID-19 was responsible for acute ischemic stroke with large vessel occlusion, since most patients had some risk factor for stroke.
Longhitano et al. 2020	Hemorrhagic events: 6 cases (2 cases on standard antithrombotic prophylaxis and 4 cases on the increased antithrombotic dose). At the increased dose, 3 cases of hemorrhagic shock and 3 cases of significant spontaneous bleeding were observed. Mortality was 3 times higher in patients on the increased dose in the intermediate-dose prophylaxis group than in patients on standard prophylaxis.	There were thrombotic complications in a high number of patients who had acute respiratory failure secondary to COVID-19 infection. And the worst results were with high-dose therapies. Therefore, further studies are important to discuss the best thromboprophylactic strategy in patients with COVID-19.

According to Wannmacher (2007), heparin is divided into UFH and LMWH. Both have indications to similar diseases, but the LMWH is prescribed in a simpler scheme of administration, has a safer dose-response relationship, has a low thrombocytopenia index (TI) and bleeding, and is more used than UFH. LMWH was synthesized in order to obtain an easier substance to administer, and it is the result of depolymerization of UFH (Weitz, 1997). Because of its predictable anticoagulant response when administered subcutaneously, it does not require laboratory monitoring. In addition, its use is permitted once or twice daily and does not require venous access and an infusion pump (Litin, Heit & Mees, 1998).

UFH has little absorption via the oral route, with intravenous (IV) or subcutaneous (SC) infusion being its most commonly used routes of administration (Nutescu, 2016). Its clinical use is in the prevention and treatment of VTE (Ministry of Health, 2021). The anticoagulant mechanism of heparins is through their binding with a serine protease inhibitor, in this case AT III, forming a UFH-AT III complex. This bond changes the conformation of the antithrombin molecule, inhibiting factors IIa (thrombin) and Xa (Nugent, 2000), and other coagulation factors such as XIIa, XIa and IXa, being inhibited both extrinsic and intrinsic and common coagulation enzymes (Albuquerque & Albuquerque, 2001). When exerting anticoagulant activity, heparin promotes clinical changes by increasing PT, APTT and thrombin time (TT) (Funk, 2012).

Other anticoagulants were used in the articles presented in this review, such as the direct-acting anticoagulants; however, these were not specifically mentioned. Direct thrombin inhibitors, for example dabigatran, inhibit both soluble thrombin and fibrin-bound thrombin, do not require a cofactor to bind to thrombin, and have no antiplatelet effect (Kam, Kaur & Thong, 2005; Lee & Ansell, 2011). In the form of parenteral use only, there is argatroban, acting in stroke prevention in atrial fibrillation (AF), acute coronary syndromes, prevention and treatment of DVT (Flato et al., 2011; Drug Bank, 2022; Pimenta et al., 2016). As for Factor Xa inhibitors, these bind directly to the active site of Factor Xa itself, making its activity in coagulation impossible (Eriksson, Quinlan & Weitz, 2009). Factor Xa inhibitors indicated for the treatment of DVT are: rivaroxaban, apixaban and edoxaban (Brandão et al., 2018). Fondaparinux is a synthetic pentasaccharide anticoagulant, which acts by indirectly inhibiting factor Xa through plasma antithrombin (Andrade et al., 2012), and is the most recent synthetic derivative of heparin, synthesized in 2004 (Smythe, Priziola, Dobesh, Wirth, Cuker & Wittkowsky, 2016).

It was reported in one of the studies, the use of VKAs that are anticoagulants acting in modulating the carboxylation of vitamin K-dependent coagulation factors. Factors II, VII, IX and X require carboxylation for their thrombotic effect (pro-coagulant activity). VKA has a narrow therapeutic range, with large variations in results, and may interact with other drugs and certain types of food. As such, their laboratory monitoring is extremely rigorous. Warfarin is the most widely used

VKA and has a longer time interval to reach its maximum anticoagulant effect (Protocolo de Anticoagulação Ambulatorial, 2020).

Aspirin or acetylsalicylic acid (ASA) is a drug, which in the form of rapid release, has antipyretic, anti-inflammatory action, treating pain, fever, flu, cold, inflammation, migraine, among others. In the extended-release form, it reduces the incidence of mortality due to cardiovascular events (blood clots, strokes, and AMI), acting as a platelet antiaggregant (Drug Bank, 2022). Another antiplatelet agent, clopidogrel, was reported in one study. Clopidogrel is an irreversible oral antagonist of the P2Y12 receptor, which is the main target of oral inhibitors, preventing thrombus formation. It is a prodrug, whose antagonist function occurs after its hepatic metabolization, which provides its binding to P2Y12 receptors. About 85% of this substance undergoes hydrolysis and only the rest will be metabolized (Falcão et al., 2013).

In this review, 2 studies using statin drugs were reported. One of the studies had no clinical outcome (Frohlich et al., 2021). The other study showed promising results regarding the use of statins (Giannis et al., 2021). The station is a hypocholesterolemic, with the function of inhibiting 3-hydroxy-3-methyl-glutaryl-CoA reductase (HMG-CoA reductase), which acts in lowering lipid levels, reducing the risk of cardiovascular disease, such as AMI and stroke (Drug Bank, 2022). With HMG-CoA reductase inhibition, it does not convert to mevalonate, preventing cholesterol synthesis (Moghadasian, 1999). Although used in the treatment of cholesterol, statins have also been used in the prevention of thrombotic events in patients with COVID-19, due to their action on systemic inflammation, stabilizing atheroma plaques and preventing the virus from destabilizing them, causing an acute coronary syndrome (Madjid et al., 2020).

Regarding the therapeutic regimens proposed in the studies used in the present review (Table 3), a variation in the dosage of the drugs used was observed. Some articles adopted the therapeutic (tAC) and prophylactic (pAC) dose of anticoagulants (Ionescu et al. 2021), one article adopted the tAC, pAC and intermediate (iAC) dose of anticoagulants (Longhitano et al. 2020), one article used pAC dose and sub therapeutic (sub tAC) dose of anticoagulant, associated with prophylactic (pAP) and sub therapeutic (sub) tAP doses of antiplatelet (Pesavento et al. 2020). It was also possible to observe articles that did not state the type of dose used Friedrich et al. (2020); Frohlich et al. (2021); Giannis et al. (2021); Li et al. (2021); Escalard et al. (2020). One article compared dosages of enoxaparin and fondaparinux (Cardillo et al., 2021) and lastly, aspirin therapy in association with antiplatelet and with other types of NSAIDs was compared.

Ionescu et al. (2021) did a comparison of different doses of antithrombotic drugs in which there was a considerable difference when comparing the effect of the two therapeutic options: UFH, enoxaparin and argatroban in tAC dose and in pAC dose. The results showed benefit in both tAC and pAC compared to patients who did not receive antithrombotic treatment. Between treatments, a greater

beneficial effect was shown in patients who received tAC compared to pAC. Around 90% of patients used some type of anticoagulant, with ⅔ using prophylactic doses and ⅓ using therapeutic doses. Severe thrombocytopenia occurred in 34 (3.4%) in the tAC group, 10 (2.8%) in the no anticoagulant group, and 27 (1.3%) in the pAC group ($p < 0.01$). The study consisted of outpatients and ICU patients undergoing mechanical ventilation. Regarding the survival probability in ICU inpatients, a rate of 56.3% was observed for tAC compared to 22.5% of the pAC dose. For outpatients, the survival rate was 78.5% for tAC compared to 65.7% for pAC. When mortality was evaluated, the tAC dose therapy showed an 86% decrease in the risk of death compared to pAC which showed a 65% decrease in the risk of death.

In another study, Attacc Investigators et al. (2021) sought to evaluate whether a strategy with anticoagulation using UFH and LMWH in tAC would promote improvements in non-critical patients with COVID-19. The results showed an increased likelihood of survival, with hospital discharge and reduced use of cardiovascular or respiratory support through use of tAC dose. On the other hand, Remap-Cap Investigators et al. (2021) showed that critically ill patients with COVID-19 using tAC dosing of UFH or LMWH did not have an increased likelihood of survival, or even a greater number of days without cardiovascular or respiratory support, when compared to patients on pAC dose treatment (survival rate of 62.7% on tAC and 64.5% on pAC).

Pesavento et al. (2020) analyzed the use of anticoagulant with antiplatelet agent in pAC, sub tAC, pAP and sub tAP doses, and observed a higher incidence of hemorrhage in patients who used sub tAC. Thus, the use of heparin at higher doses was not able to reduce the risk of fatal and non-fatal complications in the face of hemorrhagic risk. According to Flumignan et al. (2020), high dosages of anticoagulants do not show relevant results in the difference of mortality rates and still increase the risk of bleeding, when compared to anticoagulants at lower doses, in patients hospitalized with COVID-19.

Regarding prophylaxis of thrombotic events, Rossi et al. (2020) stated that there is no indication regarding prophylaxis in DVT. However, this prophylaxis when LMWH is used can be useful, especially in patients with a high risk for DVT, when there is no increased risk of bleeding. According to the WHO, the guideline is to use daily prophylactic doses of LMWH or UFH in the subcutaneous form twice daily (WHO, 2020).

Longhitano et al. (2020) evaluated the thrombotic risk in patients with COVID-19 and compared three anticoagulant treatment options, such as enoxaparin, heparin, and fondaparinux, at pAC doses and at higher doses including tAC and iAC. The analysis showed that iAC or tAC doses did not decrease the prevalence of thrombotic events. In addition, 6 cases of severe bleeding complications were reported, with 2 cases occurring when using the pAC dose and 4 cases distributed

over tAC and iAC. The authors found a 3-fold higher mortality (OR 3.38) among users who received such doses.

COVID-19 can cause various damages such as alveolar lung damage, acute respiratory failure with a high prevalence of developing cardiovascular disease and virus-related cardiac lesions (Huang et al., 2020). The fact that it can generate an extremely intense inflammatory process, with production of inflammatory cytokines such as IL-6, contributes to the increased risk of thrombotic events (Ulhaq & Soraya, 2020). Cardillo et al. (2021) found that both fondaparinux and enoxaparin similarly reduced D-dimer levels, although enoxaparin proved to be more effective in this reduction, when analyzed 100 patients under these therapies. However, fondaparinux was more effective in reducing C-reactive protein (CRP), and both drugs were able to reduce lactate dehydrogenase (LDH) and IL-6, but were not able to reduce fibrinogen levels.

Coagulopathy is evaluated according to some parameters, such as fibrinogen, D-dimer, factor VIII and PT prolongation indexes, as well as APTT. Such factors, when altered, have associations with unfavorable clinical outcome and prevalence of deaths (Tang, Bai, Chen, Gong, Li & Sun, 2020). Evidence has indicated an association of enoxaparin with a reduction in in-hospital mortality as well as in the number of ICU admissions. In addition, they have more significant effects in the elderly, more severely ill patients, and those with high levels of IL-6 and D-dimer. In one of the studies reviewed by the Brazilian Ministry of Health, it was shown that, in an analysis adjusted for population characteristics and severity of COVID-19, enoxaparin has an association with reduced risk of developing severe acute respiratory distress syndrome (ARDS) and mortality (Ministério da Saúde, 2021). Thus, the benefit of heparin use in patients with COVID-19 is highlighted.

Frohlich et al. (2021) analyzed the use of DOACs associated with antiplatelet agents and VKA and reported that this association was able to reduce thrombotic events. However, they point out that the use of DOACs in COVID-19 does not protect against thromboembolic and hemorrhagic complications and that, therefore, substitution to parenteral anticoagulation is necessary. Another study compared prophylactic doses of anticoagulants, UFH, LMWH and argatroban, and demonstrated the occurrence of peaks in the dosage of coagulation markers. This may indicate the need to increase the timing of thromboprophylaxis in critically ill patients or those with additional prothrombotic risk factors, in order to improve the efficacy of the therapy (Friedrich et al., 2020).

Regarding platelet aggregation, Sahai et al. (2021), through a cohort of patients who used aspirin, or other NSAIDs, or both treatments, demonstrated that NSAIDs did not show changes in mortality. According to the study, aspirin failed to realize its protective effect probably due to the dose amount, an inefficient platelet inhibition mechanism, or some altered platelet phenotype. Aspirin, by its inhibition of cyclooxygenase-1, prevents the formation of thromboxane A2 and is considered an excellent platelet antiaggregant drug. The fact that patients, even using aspirin, present cardiovascular

events was the starting point to think about the concept of aspirin resistance in these patients (Oliveira, Silva, Silva & Lima, 2010). The resistance to aspirin was described by Gum et al. (2003).

In the study by Manne et al. (2020), where platelet gene expression and physiological responses of patients with COVID-19 were examined, very expressive changes in platelet gene expression were reported, and an intense reaction in this expression was noted in SARS-CoV-2 infection. Furthermore, in the RNA-seq of the platelet isolate, they identified the expression of 3090 genes among non-ICU patients, and 2,256 genes expressed in ICU patients, compared to healthy donors. They also observed that platelets exhibited more aggregation, adhesion, and dissemination, as a result of increased and released thromboxane A2. These results assume new evidence that the platelet gene is altered, with increased functional responses in COVID-19, suggesting a contribution to the thrombotic events.

Li et al. (2021) evaluated the action of anticoagulants in decreasing thromboembolic risk and found that, in addition to decreasing thromboembolic risk, they decreased the risk of mortality; although patients with AF have a higher risk of systemic thromboembolism, even with the use of anticoagulants. AF is a disorder of atrial electrical activity, with consequent loss of atrial systole and is the most common arrhythmia in clinical practice, involving 3% of the adult population, being more common in advanced age groups (Cintra & Figueiredo, 2021). In this sense, it is indicated to verify if patients with COVID-19 present AF.

Escalard et al. (2020) described an initial experience of treating patients with COVID-19 presenting acute ischemic stroke due to large vessel occlusion. A total of 10 patients were treated with mechanical thrombectomy and there was successful recanalization in 9 (90%) patients. In 5 (50%) patients, treatment with the fibrinolytic agent alteplase was performed. Although 4 patients were treated with anticoagulants, the onset of an acute ischemic stroke with large vessel occlusion could not be prevented, with a total of 6 deaths. Most patients (70%) had mild or absent respiratory symptoms at the time of stroke. This suggests no relationship between severity of respiratory symptoms and risk of acute ischemic stroke with large vessel occlusion.

Giannis et al. (2021), analyzed the incidence of thromboembolic events in patients using anticoagulants and statins associated with antiplatelet agents and showed a reduction in these events. The positive effects of statins in reducing VTE and mortality are already known, however, this is not yet established in the case of COVID-19. Glynn et al. (2009), conducted an intervention study evaluating rosuvastatin against PE or VTE events, and patients receiving rosuvastatin were able to have a significant reduction in the occurrence of symptomatic VTE. According to Madjid et al. (2020), statins act on systemic inflammation by stabilizing atheroma plaques and preventing SARS-CoV-2 from destabilizing them and causing an acute coronary syndrome.

It is known that SARS-CoV-2 entering the host cell through the angiotensin-converting enzyme 2 (ACE2), causes negative regulation of this enzyme and induces pro-inflammatory responses by

activating the Toll-like receptor (TLR)- MYD88-NF-κB pathway (Khavidaki and Khalili, 2020). As statins possess hypolipemic and immunomodulatory properties, it was seen that in experimental models they inhibit MYD88-NF-κB and promote positive ACE2 regulation, generating benefit in patients with COVID-19. However, inhibition in TLR and NF-κB receptor signaling by statins may contribute to an exacerbation of compensatory immune signals, leading to a worse disease prognosis, even though there is an improvement, for example, in lung injury due to their anti-inflammatory action (Khavidaki & Khalili, 2020).

In view of the results analyzed through this systematic review, it was found that treatment with anticoagulants showed greater benefits when used in tAC dosage of the drugs enoxaparin, UFH, argatroban, fondaparinux and oral anticoagulants. Drug combinations also proved beneficial, for example, enoxaparin associated with fondaparinux, as well as DOACs in conjunction with VKA. Importantly, antiplatelet use did not promote a reduction in thrombotic events. However, the use of antiplatelet and statins was associated with reduced VTE and mortality. It was noticed in this review, that when anticoagulants are administered in sub tAC doses the results were not promising, for example in the use of UFH, LMWH and fondaparinux, however with divergences among the studies. Treatments with the fibrinolytic, alteplase also did not show satisfactory results.

4 CONCLUSIONS

In conclusion, there is strong evidence that anticoagulants are beneficial in COVID-19, although there are particularities and contraindications in certain patients who have a predisposition to greater bleeding and, in this case, require another therapeutic option. Thus, more robust studies are still needed to be aware of the real effect of antithrombotic agents on COVID-19, to define the best therapy to be adopted in these patients.

REFERENCES

Aghajani, M.H., Moradi, O., Amini, H., Tehrani, H.A., Pourheidar, E., Rabieri, M.M & Sistanizad, M. (2021). Decreased in-hospital mortality associated with aspirin administration in hospitalized patients due to severe COVID-19. J Med Virol. 93:5390–5395; doi: 10.1002/jmv.27053.

Albuquerque, D.C & Albuquerque, F.N. (2001). Utilização das heparinas nas síndromes isquêmicas agudas. Revista Socerj Vol XIV, 29-33. No 1.Artigo de revisão.

Andrade, P.B.,Tebet, M.A.,Nogueira, E.F., Andrade, M.V.A., Barbosa, R.A., Labrunie, A & Mattos, L.A. (2012). Fondaparinux em intervenção coronária percutânea no tratamento da síndrome coronária aguda. Artigos Originais • Rev. Bras. Cardiol. Invasiva 20 (2) • June 2012 • https://doi.org/10.1590/S2179-83972012000200008

Argatroban (2020). Drug Bank https://go.drugbank.com/drugs/DB00278

Aspirina (2020). DrugBank. https://go.drugbank.com/drugs/DB00945

ATTACC Investigators, ACTIV-4a Investigators, REMAP-CAP Investigators, Lawler, P. R., Goligher, E. C., Berger, J. S., Neal, M. D., McVerry, B. J., Nicolau, J. C., Gong, M. N., Carrier, M., Rosenson, R. S., Reynolds, H. R., Turgeon, A. F., Escobedo, J., Huang, D. T., Bradbury, C. A., Houston, B. L., Kornblith, L. Z., Kumar, A., … Zarychanski, R. (2021). Therapeutic Anticoagulation with Heparin in Noncritically Ill Patients with Covid-19. *The New England journal of medicine*, *385*(9), 790–802. https://doi.org/10.1056/NEJMoa2105911

Barros L.L. S., Maia, C.S.F., Monteiro, M.C. Fatores de risco associados ao agravamento de sepse em pacientes em Unidade de Terapia Intensiva. Artigo Original • Cad. saúde colet. 24 (4) • Oct-Dec 2016 • https://doi.org/10.1590/1414-462X201600040091

Batschauer, A.P.B & Jovita, H.W. (2020). Hemostasis and COVID-19: pathophysiology, laboratory tests and anticoagulant therapy. Instituição: Universidade do Vale do Itajaí (Univali). Itajaí-SC, Brasil.

Benvenuto, D., Giovanetti, M., Ciccozzi, A., Spoto, S., Angeletti, S & Ciccozzi, M. (2020). The 2019-new coronavirus epidemic: evidence for virus evolution. J Med Virol. 92: 455-9.

Bikdeli, B., Madhavan , M.V., Gupta, A., Jimenez , D., Burton, J.R., Nigoghossian, C.D, Chuich, T., Nouri, S.N., Dreyfus, I., Driggin, E., Sethi, S., Sehgal, K., Chatterjee, S., Ageno, W., Madjid, M., Guo, Y., Tang, L.V., Hu, Y., Bertoletti, L., Giri, J., Cushman, M., Quéré, I., Dimakakos, E.P., Gibson, C.M., Lippi, G., Favaloro, E.J., Fareed, J., Tafur, A.J., Francese, D.P., Batra, J., Falanga, A., Clerkin, K.J., Uriel, N., Kirtane, A., McLintock, C., Hunt, B.J., Spyropoulos, A.C., Barnes, G.D., Eikelboom, J.W., Weinberg, I., Schulman, S., Carrier, M., Piazza, G., Beckman, J.A., Leon, M.B., Stone, G.W., Rosenkranz, S., Goldhaber, S.Z., Parikh, S.A., Monreal, M., Krumholz, H.M., Konstantinides, S.V., Weitz, J.I., Lip, G.Y.H & Global COVID-19 Thrombosis Collaborative Group. (2020). Pharmacological Agents Targeting Thromboinflammation in COVID-19: Review and Implications for Future Research. Thromb Haemost 120(07): 1004-1024. DOI: 10.1055/s-0040-1713152

Brandão, G.M.S., Cândido, R.C.F., Rollo, H.A., Sobreira, M.L & Junqueira, D.R. (2018). Direct oral anticoagulants for treatment of deep vein thrombosis: overview of systematic reviews. J Vasc Bras. 2018, October.-December.; 17(4):310-317.https://doi.org/10.1590/1677-5449.005518

Brito, A.P; Brito, M.V; Quintino, A. Mansour, I. Recio, C & Picanço, N.(2020). Gastrointestinal manifestations in patients infected with SARS-CoV-2: Systematic literature review. Braz. J. Hea. Rev., Curitiba, v. 3, n. 5, p. 14570-14583 2020 september./october. 2020 ISSN 2595-6825.

Cardillo, G., Viggiano, G.V., Russo, V., Mangiacapra, S., Cavalli, A., Castaldo, G., Agrusta, F., Snr, A.B., Snr, M.A., Iannuzz, M., Sacco, C., Lodigiani, C., Fontanella, A & Micco, P. Antithrombotic and Anti-Inflammatory Effects of Fondaparinux and Enoxaparin in Hospitalized COVID-19 Patients: The FONDENOXAVID Study. J Blood Med. 2021 Feb 11;12:69-75. doi: 10.2147/JBM.S285214. eCollection 2021.

Centers for Disease Control and Prevention. Increased Risk of Hospitalization or Death Age Increases Risk for Severe Illness. [Internet] CDC; 2021 [citado 2021 jan 27]. Disponível em https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/older-adults.html » https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/older-adults.html

Ceraolo, C & Giorgi, F. (2020). Genomic variance of the 2019-nCoV coronavirus. J Med Virol

Cintra, F.D & Figueiredo, M. J. O. (2021) Fibrilação Atrial (Parte 1): Fisiopatologia, Fatores de Risco e Bases Terapêuticas. Arq. Bras. Cardiol. 2021; 116(1): 129-139.

Driggin , E., Madhavan , M.V., Bikdeli , B., Chuich , T., Laracy , J., Zoccai , G.B., Brown , T.S., Nigoghossian , C.D., Zidar , D.A., Haythe , J., Brodie , D., Beckman , J.A., Kirtane, A.J., Stone , G.W., Krumholz, H.M & Parikh, S.A. (2020). Cardiovascular Considerations for Patients, Health Care Workers, and Health Systems During the COVID-19 Pandemic. J Am Coll Cardiol. 2020 May 12;75(18):2352-2371. doi: 10.1016/j.jacc.2020.03.031. Epub 2020 Mar 19.

Eriksson, B.I., Quinlan, D.J & Weitz, J.I. (2009) Comparative pharmacodynamics and pharmacokinetics of oral direct thrombin and factor xa inhibitors in development. Clin Pharmacokinet. 2009;48(1):1-22. http:// dx.doi.org/10.2165/0003088-200948010-00001. PMid:19071881.

Escalard, S., Maier, B., Redjem, H., Delvoye, F., Hébert, S., Smajda, S., Ciccio, G., Desilles, J.P., Mazighi, M., Blanc R & Piotin, M. Treatment of Acute Ischemic Stroke due to Large Vessel Occlusion With COVID-19: Experience From Paris. Stroke. 2020 Aug;51(8):2540-2543.doi:10.1161/STROKEAHA.120.030574. Eub 2020 May 29.

Estatinas (2020). Drug Bank https://go.drugbank.com/drugs/DB01098

Falcão, F.J.A., Carvalho, L.; Chan, M.; Alves, C.M.R.; Carvalho, A.C.C & Caixeta, A.M. (2013). P2Y12 platelet receptors: importance in percutaneous coronary intervention. Artigo de Revisão • Arq. Bras. Cardiol. 101(3) • September 2013 • https://doi.org/10.5935/abc.20130162
Flato et al., 2011. Novos anticoagulantes em cuidados intensivos. Artigos de Revisão • Rev. bras. ter. intensiva 23 (1) • Mar 2011 • https://doi.org/10.1590/S0103-507X2011000100012

Flumignan, R.L., Tinôco, J.D.S., Pascoal, P.I., Areias, L.L., Cossi, M.S., Fernandes, M.I., Costa, I.K., Souza, L., Matar, C.F., Tendal, B., Trevisani, V.F., Athallah, A.N & Nucano, L.C (2020). Prophylactic anticoagulants for people hospitalised with COVID-19. Cochrane Database of Systematic Reviews 2020, Issue 10. Art. No.: CD013739. DOI: 10.1002/14651858.CD013739. Acesso em 6 de julho de 2022

Friedrich, M.S., Studt, J.D., Braun, J., Spahn, D.R & Kaserer, A. Coronavirus-induced coagulopathy during the course of disease. PLoS One. 2020 Dec 17;15(12):e0243409. doi: 10.1371/journal.pone.0243409. eCollection 2020.

Frohlich , G.M., Jeschke , E., Eichler , U., Thiele, H., Alhariri, L., Reinthaler , M.,Kastrati , A., Leistner , D.M., Skurk , C., Landmesser , U & Gunster , C. Impact of oral anticoagulation on clinical outcomes of COVID-19: a nationwide cohort study of hospitalized patients in Germany. Clin Res Cardiol. 2021 Jul;110(7):1041-1050.doi: 10.1007/s00392-020-01783x. Epub 2021 Jan 8.

Funk, D.M.A. (2012) Coagulation assays and anticoagulant monitoring. Hematology Am Soc Hematol Educ Program. 2012;2012:460-5. doi: 10.1182/asheducation-2012.1.460. PMID: 23233620.

Giannis,D., Barish, M.A Goldin, M., Cohen, S.L., Kohn, N., Gianos, E., Chatterjee, S., Lesser, M., Coppa, K., Hirsch, J.S., McGinn, T & Spyropoulos, C.A. Incidence of Venous Thromboembolism and Mortality in Patients with Initial Presentation of COVID-19. J Thromb Thrombolysis. 2021 May;51(4):897-901.doi: 10.1007/s11239-021-02413-7. Epub 2021 Mar 5.

Glynn, R.J., Danielson, E., Fonseca, F.A.H., Genest, J., Gotto, A.M., Kastelein, J.J.P., Koenig, W., Libby, P., Lorenzatti, A.J., MacFadyen, J.G., Nordestgaard, B.G., Shepherd, J., Willerson, J.T & Ridker, P.M. A randomized trial of rosuvastatin in the prevention of venous thromboembolism: the JUPITER trial. N Engl J Med. 2009;360(18):1851-61.

Gomez, B.M., Ramos, R.M.L., Rogado, J., Moreno, A.F., Obispo, B., Chiriboga, D.S., Vaquero, T.S., Macho, J.T., Motos, A.A., Camarero, C.C., Diaz, A.T., Velasco, E.R., Sarasqueta, J.C & Rivas, N.M. (2021). Incidence of pulmonary embolism in non-critically ill COVID-19 patients. Predicting factors for a challenging diagnosis. Journal of Thrombosis and Thrombolysis volume 51, pages 40–46

Gouveia, C. C & Campos, L. Coronavirus Disease 2019. (2020). Clinical Review. Acta Med Port, v. 33, n. 7-8, July.-August. 2020 p. 505-511. Disponível em: https://doi.org/10.20344/amp.13957"

Gum, P.A., Marchant, K.K., Welsh, P.A., White, J & Topol, E.J. A prospective, blinded determination of the natural history of aspirin resistance among stable patients with cardiovascular disease. J Am Coll Cardiol. 2003 Mar 19;41(6):961-5. doi: 10.1016/s0735-1097(02)03014-0.

Helms , J., Tacquard, C., Severac , F., Lorant , I.L., Ohana , M., Delabranche, X., Merdji , H., Jehl , R.C., Schenck , M., Gandet , F.F., Kremer , S.F., Castelain , V., Schneider , F., Grunebaum, L., Cano , E.A., Sattler , L., Mertes , P.M & Ferhat Meziani (2020). High risk of thrombosis in patients with severe SARS-CoV-2 infection: a multicenter prospective cohort study. Intensive Care Med. 46(6):1089-1098.doi: 10.1007/s00134-020-06062-x. Epub 2020 May

Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu., Y., Zhang, L., Fan, G., Xu, J., Gu, X., Cheng, Z., Yu, T., Xia, J., Wei, Y., Wu, W., Xie, X., Yin, W., Li, H., Liu, M., Xiao, Y., Gao, H., Guo, Li., Xie, J., Wang, G., Jiang, R., Gao, Z., Jin, Q., Wan, J & Cao, B. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet. 2020 Feb 15;395(10223):497-506. doi:10.1016/S0140-6736(20)30183-5. Epub 2020 January 24.

Ionescu, F., Jaiyesimi, I., Petrescu, I., Lawler, P.R., Castillo, E., Maldonado, Y.M., Imam, Z., Narasimhan , M., Abbas, A.E., Konde, A & Nair, G.B. Association of anticoagulation dose and survival in hospitalized COVID-19 patients: A retrospective propensity score-weighted analysis. Eur J Haematol. 2021 Feb;106(2):165-174. doi: 10.1111/ejh.13533. Epub 2020 Nov 4.

Itkonen, M.K., Tornio, A., Reiniluoto, O,L., Neuvonen, M., Neuvonen, P,J., Niemi, M & Backman, J.T. (2019). Clopidogrel Increases Dasabuvir Exposure With or Without Ritonavir, and Ritonavir Inhibits the Bioactivation of Clopidogrel. Clin Pharmacol Ther. 105(1):219-28.

Joly, B.S., Siguret., V & Veyradier, A. (2020). Understanding pathophysiology of hemostasis disorders in critically ill patients with COVID-19. IntensiveCareMed

Kam, P.C., Kaur, N & Thong, C.L. (2005). Direct thrombin inhibitors: pharmacology and clinical relevance. Anaesthesia.;60(6):565-74. http:// dx.doi.org/10.1111/j.1365-2044.2005.04192.x. PMid:15918828.

Khavidaki, S.D & Khalili, H. (2020). Considerations for Statin Therapy in Patients with COVID-19. Pharmacotherapy. 2020 May;40(5):484-486. doi: 10.1002/phar.2397. Epub 2020 May 4.

Klok, F.A.,Kruip, M.J.H.A., Meer, N.J.M.V.D., Arbous, M.S., Gommers, D.A.M.P.J., Kant, K.M., Kaptein, F.H.J., Paassen, J.V., Stals, M.A.M., Huisman, M.V & Endeman, H. (2020). Incidence of thrombotic complications in critically ill ICU patients with COVID-19. Thromb Res. 2020 July;191:145-147.doi: 10.1016/j.thromres.

Lee, C.J & Ansell, J.E. (2011) Direct thrombin inhibitors. Br J Clin Pharmacol.72(4):581-92. http://dx.doi.org/10.1111/j.1365-2125.2011.03916.x. PMid:21241354.

Li, T., Lu, H & Zhang, W. (2020). Clinical observation and management of COVID-19 patients. Emerg Microbes Infect.;9(1):687-690. doi: 10.1080/22221751.2020.1741327

Li, W., Xu, Z., Xiang, H., Zhang, C., Guo, Y & Xiong, J. Risk factors for systemic and venous thromboembolism, mortality and bleeding risks in 1125 patients with COVID-19: relationship with anticoagulation status. Aging (Albany NY). 2021 Mar 26;13(7):9225-9242.doi: 10.18632/aging.202769. Epub 2021 Mar 26.

Litin, S.C., Heit, J.A & Mees, K.A. (1998) Use of low-molecular-weight heparin in the treatment of venous thromboembolic disease: answers to frequently asked questions. The Thrombophilia Center Investigators. Mayo Clin Proc 1998 June;73(6):545-50; teste 551.doi: 10.4065/73.6.545

Longhitano, Y., Racca, F., Zanza, C., Muncinelli, M., Guagliano, A., Peretti, E., Minerba, A.C., Mari, M., Boverio, R., Salio, M., Chichino, G., Franceschi, F., Piccioni, A., Abenavoli, L., Salvini, M & Artico, M.. (2020). Venous Thrombo-Embolism in Hospitalized SARS-CoV-2 Patients Treated with Three Different Anticoagulation Protocols: Prospective Observational Study. Biology 9, 310; doi:10.3390/biology9100310.

Madjid, M., Naeini, P.S., Solomon, S.D & Vardeny, O. (2020). Potential Effects of Coronaviruses on the Cardiovascular System: A Review. JAMA Cardiol 2020; doi: 10.1001/jamacardio.2020.1286.

Manne, B.K., Denorme, F., Middleton, E.A., Portier., I., Rowley, J.W., Stuben, C., Petrey, A.C., Tolley, N.D., Guo, L., Cody, M., Weyrich, A.S., Yost, C.C., Rondina, M.T & Campbell, R.A. Platelet gene expression and function in patients with COVID-19. Blood. 2020 September 10;136(11):1317-1329. doi: 10.1182/blood.2020007214.

Marsousi, N., Daali , Y., Fontana , P., Reny , J.L., Sirot , V.A., Calmy, A., Rudaz , S., Desmeules , J.A & Samer, C.F. (2018). Impact of Boosted Antiretroviral Therapy on the Pharmacokinetics and Efficacy of Clopidogrel and Prasugrel Active Metabolites. Clin Pharmacokinet. October;57(10):1347-1354. doi: 10.1007/s40262-018-0637-6.

Middeldorp, S., Coppens, M., Haaps, T.F.V., Foppen, M., Vlaar, A.P., Muller, M.C.A., Bouman, C.C.S., Beenen, L.F.M., Kootte, R.S., Heijmans, J., Smits, L.P., Bonta, P.I & Es, N.V. (2020). Incidence of venous thromboembolism in hospitalized patients with COVID-19. J Thromb Haemost (8):1995-2002.doi: 10.1111/jth.14888. Epub 2020 Jul 27.

Ministerio da Saude (2021). Enoxaparina para o tratamento de pacientes com COVID-19 Março:(2021) Centro Colaborador do SUS: Avaliação de Tecnologias e Excelência em Saúde – CCATESwww.gov.br/saude/pt-br/coronavirus/publicacoes-tecnicas/notas-tecnicas/nota-tecnica-enoxaparina-covid-19.pdf

Moghadasian, M.H. (1999). Clinical pharmacology of 3-hydroxy-3-methylglutaryl coenzyme A reductase inhibitors. Ciência da Vida. 1999;65(13):1329-37. doi: 10.1016/s0024-3205(99)00199-x.

Morales, A.J.R., Ospina , J.A.C., Ocampo, E.G., Peña, R.V., Rivera , Y.H., Antezana, J.P.E., Arnez, L.E.A., Aldana, D.J.B., Paredes, C.F., Martinez, A.F.H., Mondolfi, A.P., Grisales, G.J.L, Vallejo, E.R., Suárez, J.A., Zambrano, L.I., Gómez , W.E.V., Ramon, G.J.B., Rabaan, A.A., Harapan, H., Dhama, K., Nishiura, H., Kataoka, H., Ahmad, T & Sah, R. Latin American Network of Coronavirus Disease 2019-COVID-19 Research (LANCOVID-19). Electronic address: https://www.lancovid.org. (2020) Características clínicas, laboratoriais e de imagem do COVID-19: uma revisão sistemática e meta-análise. Travel Med Infect Dis. (no prelo). doi:10.1016/j.tmaid.2020.101623

Nugent, M.A. (2000). Heparin sequencing brings structure to the function of complex oligosaccharides. Proc Natl Acad Sci U S A.;97(19):10301–3

Nutescu, E.A., Burnet, A., Fanikos, J., Spiler, S & Wittkowsky, A. (2016). Pharmacology of anticoagulants used in the treatment of venous thromboembolism. J Thromb Thrombolysis (2016) 41:15–31 DOI 10.1007/s11239-015.

Oliveira, D.C., Silva, R.F., Silva, D.J & Lima, V.C. (2010). Resistência à aspirina: realidade ou ficção?. Atualização Clínica • Arq. Bras. Cardiol. 95 (3) • September 2010 • https://doi.org/10.1590/S0066-782X2010001300024.

OPAS (2020). https://www.paho.org/pt/covid19/historico-da-pandemia-covid-19

Organização Mundial da Saúde (OMS) (2020). Manejo clínico de infecção respiratória aguda grave quando há suspeita de infecção por novo coronavírus (2019-nCoV). Orientação provisória 28 de janeiro de 2020. Disponível em:https://www.who.int/docs/default-source/coronaviruse/clinical-management-of-novel-cov.pdf

Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Systematic Reviews 2021;10:89

Pan, L., Mu, M., Yang, P., Sun, Y., Wang, R., Yan, J., Li, P., Hu, B., Wang, J., Hu, C., Jin, Y., Niu, X., Ping, R., Du, Y., Li, T., Xu, G., Hu, Q & Tu, L.(2020). Clinical Characteristics of COVID-19 Patients With Digestive Symptoms in Hubei, China: A Descriptive, Cross-Sectional, Multicenter Study. Am J Gastroenterol;115(5):766-773.doi: 10.14309/ajg.0000000000000620.

Pancani, R.; Villari, L.; Foci, V.; Parri, G.; Barsotti, F.; Patrucco, F.; Malerba, M.; Vincenti, R.; Carrozzi, L & Celi, A. (2021). Lower limb deep vein thrombosis in COVID-19 patients admitted to intermediate care respiratory units. Trombose Research. Full Length Article. Volume 197, P44-47, JANUARY 01.

Pereira, A.F., Terra, A.K.A., Oliveira, C.H.S., Terra, M.C., Oliveira, C.M., Carvalho, L.P., Oliveira, S.C., Rotondo, K.O.L., Botelho, L.M., Oliveira, C.S., Camilo, F.F., Delmoro, A.C.L & Salles, B.C.C. (2021). Alterações hematológicas e hemostasia na COVID-19: uma revisão de literatura. Research, Society and Development, v. 10, n. 11, p. e171101119409-e171101119409.

Pesavento, R., Ceccato, D., Pasquetto, G., Monticelli, J., Leone, L., Frigo, A., Gorgi, D., Postal, A., Marchese, G.M., Cipriani, A., Saller, A., Sarais, C., Criveller, P., Gemelli, M., Capone, F., Fioretto, P., Pagano, C., Rossato, M., Avogaro, A., Simioni, P., Prandoni, P & Vettor, R. The hazard of (sub)therapeutic doses of anticoagulants in non-critically ill patients with Covid-19: The Padua province experience. J Thromb Haemost. 2020 Oct; 18(10): 2629–2635.Published online 2020 Aug 24. doi: 10.1111/jth.15022

Pimenta, R.E.F., Yoshida, W.B., Rollo, H.A., Sobreira, M.L., Bertanha, M., Mariúba, J.V.O., Jaldin, R. G & Camargo, P.A.B. Heparin induced thrombocytopenia in a patient with acute arterial occlusion. J Vasc Bras. 2016 Abr.-Jun.; 15(2):138-141. http://dx.doi.org/10.1590/1677-5449.004215

Protocolo de Anticoagulação Ambulatorial (2020) https://prefeitura.pbh.gov.br/sites/default/files/estrutura-de-governo/saude/2021/protocolo_anticoagulacao_ambulatorial.pdf

REMAP-CAP Investigators, ACTIV-4a Investigators, ATTACC Investigators, Goligher, E. C., Bradbury, C. A., McVerry, B. J., Lawler, P. R., Berger, J. S., Gong, M. N., Carrier, M., Reynolds, H. R., Kumar, A., Turgeon, A. F., Kornblith, L. Z., Kahn, S. R., Marshall, J. C., Kim, K. S., Houston, B. L., Derde, L., Cushman, M., … Zarychanski, R. (2021). Therapeutic Anticoagulation with Heparin in Critically Ill Patients with Covid-19. The New England journal of medicine, 385(9), 777–789. https://doi.org/10.1056/NEJMoa2103417

Rossi, F. (2020). Venous thromboembolism in COVID-19 patients. Review Article. J. Vasc. Bras. 19 • 2020 • https://doi.org/10.1590/1677-5449.200107

Sahai, A., Bhandari, R., Godwin, M., McIntyre, T., Chung, M.K., Iskandar, J.P., Kamran, H., Hariri, E., Aggarwal, A., Burton, R., Kalra, A., Bartolomeu, J.R., McCrae, K.R., Elbadawi, A., Bena, J., Svensson, L.G., Kapadia, S & Cameron, S.J. Effect of aspirin on short-term outcomes in hospitalized patients with COVID-19. Vasc Med. 2021 Dec;26(6):626-632. doi: 10.1177/1358863X211012754. Epub 2021 May 19.

Singh, A.K., Gillies, C.L., Singh, R., Singh, A., Chudasama, Y., Coles, B., Seidu, S., Zaccardi, F., Davies, M.J & Khunti, K. (2020). Prevalence of co-morbidities and their association with mortality in patients with COVID-19: a systematic review and meta-analysis. Diabetes, Obesity and Metabolism, v. 22, n. 10, p. 1915-1924.

Smythe, M.A., Priziola, J., Dobesh, P.P., Wirth, D., Cuker, A & Wittkowsky, A.K.(2016). Diretrizes para o manejo prático dos anticoagulantes heparínicos no tratamento do tromboembolismo venoso.J Trombólise Trombólise.2016;41(1):165-186.

Soeiro, A.M., Leal, T.C.A.T., Pereira, M.P., Lima, E.G., Figueiredo, A.C.B.S., Petriz, J.L.F., Precoma, D.B & Serrano, C.V. Jr. (2020). Position Statement on the Use of Antiplatelet Agents and Anticoagulants in Patients Infected with the New Coronavirus (COVID-19) – 2020. Arq Bras Cardiol.115(2):292-301.

Souza, V.I., Scodro, R.B.L., Siqueira, V.L.D.,Cardoso, R.F & Caleffi-Ferracioli, K.R. (2021). Comorbidades e óbitos por covid-19 no brasil. Uningá Journal, v. 58, eUJ4054, 2021doi.org/10.46311/2318-0579.58.eUJ4054

Spiezia, L., Boscolo, A., Poletto, F., Cerruti, L., Tiberio, I., Campello, E., Navalesi, P & Simioni, P (2020). COVID-19-related severe hypercoagulability in patients admitted to intensive care unit for acute respiratory failure. Thromb. Haemost.120: 998-1000.

Tang, N., Bai, H., Chen, X, Gong, J., Li, D & Sun, Z. (2020). Anticoagulant treatment is associated with decreased mortality in severe coronavirus disease 2019 patients with coagulopathy. J Thromb Haemost. 18(5): 1094-9.doi: 10.1111/jth.1481

Tang, N., Li, D., Wang, X & Sun, Z. (2020) Abnormal coagulation parameters are associated with poor prognosis in patients with novel coronavirus pneumonia. J Thromb Haemost. 2020;18(4):844-7. http://dx.doi. org/10.1111/jth.14768. PMid:32073213.

Thachil, J., Tang, N., Gando, S., Falanga, A., Cattaneo, M., Levi, M., Clark, C & Iba, T. (2020). ISTH interim guidance on recognition and management of coagulopathy in COVID-19. J Thromb Haemost.18(5):1023-6. doi: 10.1111/jth.14810.

Ulhaq, Z.Z & Soraya, G.V. (2020). Interleukin-6 as a potential biomarker of COVID-19 progression. Med Mal Infect. 2020;50(4):382-3. http:// dx.doi.org/10.1016/j.medmal.2020.04.002. PMid:32259560.

Wannmacher, L. (2007). Heparinas de baixo peso molecular: evidências que fundamentam indicações. Uso Racional de Medicamentos. Temas selecionados. Organização Panamericana da Saúde. Brasília; 4(2).

Weitz, J.I. (1997). Low-Molecular-Weight Heparins. N Engl J Med.;337(10):688–99.

Zeng, J., Huang, J & Pan, L (2020). How to balance acute myocardial infarction and COVID-19: the protocols from Sichuan Provincial People's Hospital.Terapia Intensiva Med.

Zhou, P.,Yang, X.L., Wang, X.G., Hu, B., Zhang, L., Zhang, W., Si, H.R., Zhu, Y., Li, B., Huang, C.L., Chen, H.D., Chen, J., Luo, Y., Guo, H., Jiang, R.D., Liu, M.Q., Chen, Y., Shen, X.R., Wang, X., Zheng, X.S., Zhao, K., Chen, Q.J., Deng, F., Liu, L.L., Yan, B., Zhan, F.X., Wang, Y.Y., Xiao, G.F & Shi, Z.L. (2020). A pneumonia outbreak associated with a new

Technologies adopted to prevent falls among the elderly in communities: An integrative review

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ABSTRACT

Objective: Explore the scientific evidence on the use of technologies to prevent the risk of falls in the elderly in the community. Methodology: Integrative literature review in PubMed, Latin American and Caribbean Literature in Health Sciences and Scientific Electronic Library Online. To integrate the review, the studies needed to respond to 70% of the statements in the review checklist, to validate the quality of the manuscript. Results: 18 studies were identified, which showed the use of health technologies to mitigate the risk of falls, external and internal risk factors for the occurrence of falls and knowledge about falls as a preventive measure. Conclusions: The use of technologies allows the identification of risk factors for falls and can support the multidisciplinary planning of care based on the individualities of the elderly.

Keywords: Health of the Elderly; Accident Prevention; Accidental Falls; Biomedical Technology.

1 INTRODUCTION

Population aging has become a worldwide phenomenon. In Brazil, according to the United Nations, it is estimated that in 2030 about 12.0% of the Brazilian population will be in the age group between 60 and 80 years, and in 2100 this percentage will rise to 31.3%[1]. In this scope, the senescence that is characteristic of senile aging, causes several morphofunctional changes, such as the reduction of muscle strength and fat-free mass, the decrease in bone mass, the increase in fat deposits and the

impairment of the metabolic picture, which can cause important damages to the dependence in the performance of activities of daily living, Less autonomy and health impairment [2].

With aging, the decrease in functional capacity may corroborate with the increased risk of falls in the elderly, due to the loss of postural balance and correlates with the sudden incapacity of the neural and orthoarticular mechanisms involved in the postural conservation of the body, which tend to decrease over the years [(3)]. The presentation of decline in motor capacity may restrict the autonomy and independence of the individual; however, it cannot be attributed to the inherent characteristics of senescence, but rather to the presence of functional disability[2].

The concept of functional capacity is defined as the individual's ability to perform daily practices and self-care activities independently, without external help [(4).] In vogue to the functional capacity of the elderly, the stimulus to perform body practices and periodic physical activities leads to greater disposition, well-being, and autonomy to the individual, in addition to reducing the incidence of pathologies such as osteoporosis, diabetes, depression and certain types of cardiac risks5.

In the projection of population aging, scientific and technological advances that guarantee greater survival to the population stand out; However, providing the active aging of the population is still one of the great challenges in the health area for researchers and professionals1,2.

Faced with the challenges of primary health care in promoting actions of prevention, promotion, protection and recovery of the health of the elderly population, Ordinance No. 2,528 was established on October 19, 2006, which approved the National Health Policy for the Elderly, with the aim of providing the development of actions aimed at promoting active and healthy aging. Among the purposes of this proposal, actions to mitigate falls in people in this age group 6 stand out.

It is noteworthy that in the planning of fall prevention actions, the act of falling is characterized as a multifactorial event, outlining a high complexity of monitoring. Therefore, the assessment of the risk of falls is evidenced as one of the resources with greater efficiency in its prevention7. Thus, the use of health technologies contributes to greater adherence to prevention measures in the health care network, assisting professionals in the procedures of screening comorbidities and detecting the risk of falls in the elderly8.

From the perspective of population aging and the relationship between the occurrence of falls in the elderly, it is essential to highlight the methods adopted to prevent the risk of falls in the community scenario. Thus, this study aimed to explore the scientific evidence on the use of technologies to prevent the risk of falls of the elderly in the community.

2 METHOD

The methodological strategy adopted was the Integrative Literature Review (RIL), In the construction of the RIL, the following steps were performed: (1) Selection of the

hypothesis/elaboration of the research question; (2) Literature search of primary studies or sampling (definition of databases, establishment of inclusion and exclusion criteria, descriptors); (3) Data extraction from primary studies; (4) evaluation of the articles included; (5) categorization of studies and interpretation of results and synthesis of knowledge and (6) presentation of the review[9].

The RIL stages were held from April 2020 to May 2020. To elaborate the guiding question, the Population, Concept and Context (PCC) strategy was used. In this scope, the mnemonic was constituted in "Population", presented by the elderly; in the "Context", represented by the prevention of falls in communities and; the "Concept", referred to by the presentation of the technologies adopted for the prevention of falls, evidencing the question "What are the technologies adopted to prevent the risk of falls of the elderly in communities?".

The databases used to search for the articles were: PubMed, Latin American and Caribbean Literature in Health Sciences (LILACS) and *Scientific Electronic Library Online* (SciELO). The following descriptors were used: Health of the Elderly; Accidents due to falls; Accident Prevention. In *PubMed, the* following descriptors were used: *Health of the Elderly; Accidental Falls; Accident Prevention*. The descriptors were combined with the use of the Boolean operator "and".

As inclusion criteria, publications with free availability and in full were listed; articles written in languages Portuguese, English or Spanish; published between the years 2013 to 2020. Review articles, studies with publication of partial results and duplicate databases were excluded. This time frame is justified due to the publication of Ordinance No. 529 by the Ministry of Health in 2013, which established the National Patient Safety Program (PNSP) and safety strategies in Brazilian health facilities, including the prevention of falls10.

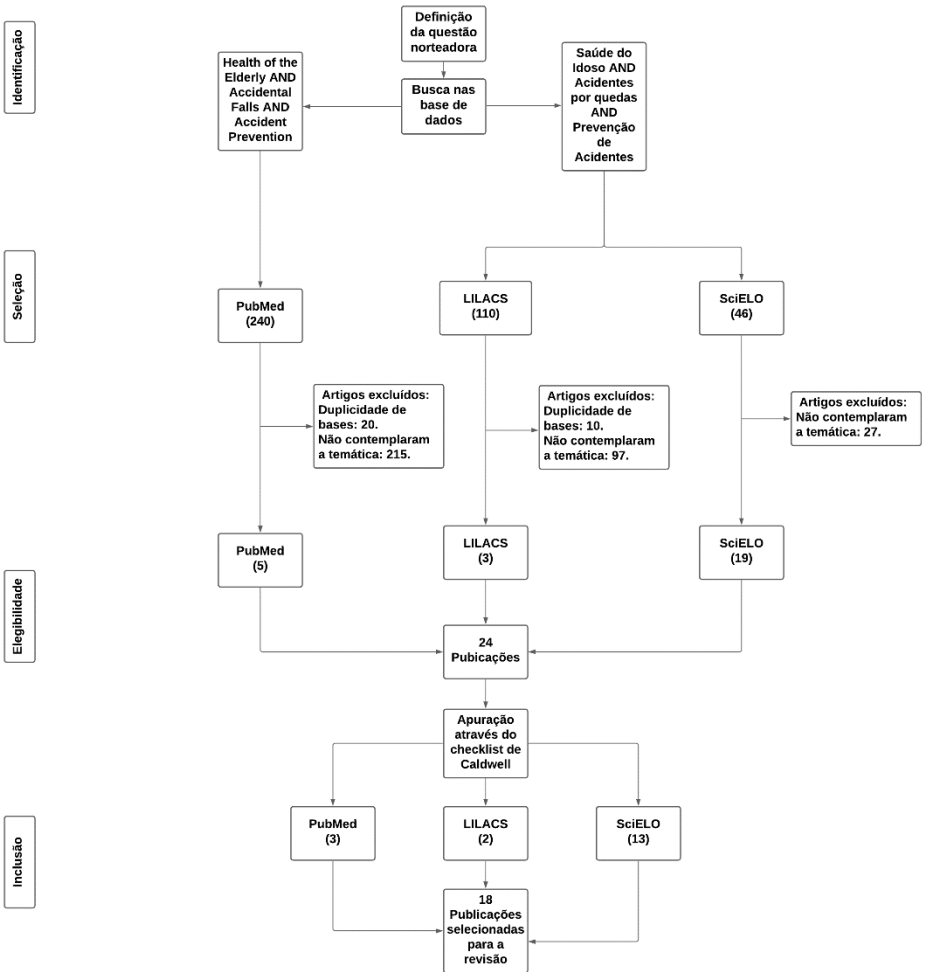
In the organization and extraction of the data, the adapted collection instrument proposed by Ursi and Galvão11 was used, containing: identification (title of the article, title of the journal, authors, country, language, year of publication), type of publication, methodological characteristics of the study, objective of the study, interventions performed, results, conclusions, limitations or biases. To integrate the review, the selected studies responded to 70% of the assertions of the *checklist12* adopted to analyze the quality of the productions, which includes questions such as: the title study reflects the content; the authors of the manuscript are reliable; the justification for conducting the research is clearly outlined; the literature review is comprehensive and up-to-date; the objective of the research is clearly indicated; all ethical issues are identified and Addressed; The methodology is identified and justified. In the organization and extraction of the data, a descriptive analysis of the selected studies was used, through the strategy Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA), being a search flowchart based on the recommendations in the check-list13.

This study does not require submission to the Ethics Committee on Research involving Human Beings, because it involves the use of secondary databases in the public domain.

3 FINDINGS

The search process in the databases showed 240 articles in PubMed, 110 in LILACS and 46 in SciELO, resulting in 396 publications that, from the application of the inclusion and exclusion criteria, and the use of the *proposed check-list*, resulted in a set of 18 publications, as shown in Figure 1.

Figure 1 – Flowchart of the selection of studies according to databases, Paranavaí-PR, Brazil, 2020.



Source: Adaptation of the PRISMA flowchart.

Chart 1 shows the main information extracted from the articles. Regarding language, all articles (n=18) were published in Brazil. Regarding the type of research, it was found that thirteen were of quantitative approach, with only one of the publications using qualitative method.

Table 1. Identification of studies included in RIL (n=18), Paranavaí, Paraná, Brazil, 2020

Article title	**Journal title/ Authors/ Year of publication/ Country.**	**Objective of the study**	**Method (Type of study)**
Construction and content validity of an instrument for the evaluation of falls in the elderly.	Einstein (São Paulo) /SILVEIRA et al./ 201814 / Brazil.	Develop and validate the content of the *online Questionnaire* for Assessment of the Risk of Falls in the Elderly.	A methodological study of the construction of the instrument was based on the International Classification of Functioning, Disability and Health (ICF). It was applied to 854 elderly people

			in Alfenas, Minas Gerais. (quantitative)
Caregiver of the elderly: knowledge, attitudes and practices about falls and their prevention.	Rev. Bras. Sick. /MAMANI et al./ 201915/ Brazil.	To investigate the knowledge, attitudes and practices of informal caregivers of the elderly about falls and their prevention.	This is a descriptive cross-sectional study conducted with 97 informal caregivers of elderly residents in the areas covered by five Family Health Strategy (FHS) Units in the city of Cuiabá. (quantitative)
Effectiveness of a multiple intervention for the prevention of falls in elderly participants of a University Open to the Third Age.	Rev. Bras. Geriatr. Gerontol. / SILVA et al./201916/ Brazil.	To evaluate the effectiveness of a multiple intervention for the prevention of falls in elderly participants of a University Open to the Third Age (UnATI).	This is a quasi-experimental, uncontrolled, longitudinal study conducted with 69 elderly people enrolled in UnATI. (quantitative)
Factors associated with falls in the elderly with cataracts.	Ciênc. Collective Health / PAZ et al./ 201817/ Brazil.	To evaluate the factors associated with falls in community-dwelling elderly with a diagnosis of cataracts.	This is a cross-sectional and analytical study conducted with 142 community-dwelling elderly, recruited through active search in active and healthy aging programs in the city of Ceilândia and in ophthalmology services of two public hospitals in the Federal District. (quantitative)
Gerontotechnology for fall prevention of the elderly with Parkinson's	Rev. Bras. Sick. /FERREIRA et al./ 201918/ Brazil.	To develop gerontological nursing care for the elderly with Parkinson's disease, aiming at health promotion through the creation of gerontotechnologies for fall prevention.	Convergent Care Research, which included the participation of nine elderly people with Parkinson's disease. (qualitative)
Incidence and predictive factors of falls in the elderly in the community: a longitudinal study	Ciênc. Collective Health / SOUZA et al./ 201919/ Brazil.	This study aimed to estimate the incidence of falls among the elderly and determine the predictive factors of recurrent falls.	Longitudinal study (2014-2016) conducted with 345 elderly people from the urban area in Uberaba-MG. (quantitative)
Perception of falls and exposure of the elderly to household risk factors	Ciênc. Collective Health /CHEHUEN NETO et al./201820/ Brazil.	The objective of this article is to describe the perception of falls among the elderly living in the community; measure the exposure of these individuals to related household risk factors.	This is a cross-sectional, quantitative study conducted in Juiz de Fora, Minas Gerais. (quantitative)

Falls in non-institutionalized elderly in the north of Minas Gerais: prevalence and associated factors.	Rev. Bras. Geriatr. Gerontol. CARNEIRO et al./ 2016[21]/ Brazil.	To estimate the prevalence of falls and associated factors in non-institutionalized elderly.	Cross-sectional study with a population-based sample of 683 non-institutionalized elderly in a city in the north of Minas Gerais (quantitative)
Relationship of falls in the elderly and the components of frailty.	Rev.Bras. epidemiol. /DUARTE et al./ 201822/ Brazil.	To assess whether the occurrence of falls in the year prior to the interview is associated with the components of frailty after a period of four years.	This is an exploratory, retrospective study conducted in 2006 and 2010 with a sample of 1,207 elderly people from the city of São Paulo. (quantitative)
Balance and functional mobility tests in the prediction and prevention of fall risks in the elderly.	Rev. Bras. Geriatr. Gerontol. /CASTRO et al./ 201523/ Brazil.	To evaluate the occurrence of falls and their associated factors and to identify the cutoff points of balance and functional mobility tests most appropriate to identify active elderly in the community at risk of falls.	Cross-sectional study composed of 127 active elderly in the community of Itabira-MG. (quantitative)
Validation of the Fall Risk Screening Tool (FRRISque) in elderly people living in the community	Ciênc. Collective Health / CHINI et al./ 201924/ Brazil.	Validate the Fall Risk Screening Tool (FRRISque) in elderly people living in the community.	A cross-sectional evaluative screening study was conducted. The sample consisted of 854 elderly people. (quantitative)
Frequency and factors associated with falls in adults aged 55 years and over.	Rev. of Public Health. / PRATO et al./ 201725/ Brazil.	To analyze the frequency and factors associated with the occurrence of falls in adults aged 55 years or older	This study was carried out in another population-based study, with a representative sample of 404 individuals aged 40 years or more in the urban area of Cambé, Paraná, in 2011. (quantitative)
Evaluation of risk factors that contribute to falls in the elderly.	Rev. Bras. Geriatr. Gerontol./ ALVES et al./201726/ Brazil.	To describe the incidence of falls in the elderly in the city of Barbacena, MG, with its causal factors, circumstances and consequences.	This is a cross-sectional study conducted by applying questionnaires to 206 patients over 60 years of age in the city of Barbacena, MG. (quantitative)
Falls in the elderly: evaluation of risk factors	Nursing (São Paulo). /SARDINE; CANTANHÊDE/ 20187/ Brazil.	To evaluate risk factors associated with falls in the elderly.	This is a descriptive, cross-sectional study conducted at the health center of liberdade in Maranhão, with 228 elderly people (quantitative)
Prevalence of fall risk and associated factors in community-dwelling elderly	Rev. Bras. Geriatr. Gerontol. /FIORITTO; CROSS; LEITE [27]/2020/ Brazil.	Estimate the prevalence of fall risk and associated factors	Cross-sectional study with 339 community-dwelling elderly living in Juiz de Fora, MG. (quantitative)

Ballroom dancing in the prevention of falls in the elderly: a case-control study	Cuidarte/ PAIVA Magazine; LOURES; MARINHO [28]/ 2019/ Brazil.	To evaluate the practice of ballroom dancing in the prevention of falls in the elderly.	This is a case-control study with 90 elderly people from a Primary Health Care Unit enrolled in the Family Health Strategy. (quantitative)
Association between symptoms of insomnia, daytime nap and falls in community elders	Cad. Public Health/ PEREIRA; CEOLIM; NERI [29]/2013/ Brazil.	To analyze associations between insomnia symptoms, daytime naps and the occurrence of falls in elderly residents in the community.	This is a cross-sectional population-based study with a probabilistic sample involving 689 elderly people from the community of Campinas, São Paulo. (quantitative)
Falls among the elderly: predictors and spatial distribution.	Rev. Salud Pública/ SOUSA et al [30]/ 2019/ Brazil.	To calculate the prevalence of falls in the last 12 months among the elderly in the Community.	Cross-sectional study conducted with 612 elderly people living in the urban area of Uberaba. (quantitative)

Source: Own elaboration.

Chart 2 shows the information regarding the use of technology in the health area, grouping related information, the strategies for preventing falls in the elderly, the classification of technologies and the main results of the inclusion of the technological resource.

Table 2 – Summary of the fall prevention strategy, technology used and main results evidenced in the studies included in the RIL (n=18).

Fall Prevention Strategies for the Elderly	**Classification of the technology employed**	**Main Findings**
Online Questionnaire for Risk Assessment of Falls in the Elderly.	Light-hard technology.	The values of the Content Validity Coefficient were satisfactory, both for the clarity (CVCt=0.76) and for the pertinence (CVCt=0.82) of the questions. The questionnaire was considered easy to understand by most of the elderly (95%), with an average of 4.75 (±0.11) points for each question14.
Mini Mental State Examination (MMSE); *Risk score of Downton*.	Light-hard technology.	More than half of the participants are aware of falls and identify them as a problem, as well as point out some risk factors and prevention measures. Regarding attitudes, more than half of the caregivers are not in favor of the prevention of falls. Most of them reported adopting practices to prevent falls in the elderly, such as changes in the home (52.6%) and supervision of the elderly (47.4%)[15].
Sociodemographic questionnaire; Geriatric Depression Scale; MEEM, *Falls Efficacy Scale-International*; e *Falls Risk Awareness Questionnaire* (FRAQ); *Timed Up and Go* (TUG), Levantar e Sentar da Cadeira e Força de Preensão Palmar.	Light-hard technology and Hard Technology.	Fifty-one of the participants were elderly [67 (±6.2) years; 76.3% women], 15 from the Control (CG), 20 from the Physical Exercise (GEF) and 16 from the Multiple Intervention (GIM) concluded the study. Both intervention groups reduced the TUG time, but only the GIM improved the FRAQ score. Both interventions had a small effect on the time of the (TUG), while the multiple intervention had a large effect on the (FRAQ)[16].
Sociodemographic questionnaire; the Katz Index, Lawton scale; MMSE; TUG; *Short Battery Performance Test*; Plataforma de Equilíbrio *Biodex Balance System*.	Light-hard technology and Hard Technology.	Among the participants, (85 of them with cataracts), with a mean age of 69.39 years (± 5.67). There was an association between falls and female gender (OR:4.45) and submaximal scores in *the Short Physical Performance Test* (SPPB) (OR:3.53) among patients with cataracts, while the

		presence of multimorbidities (OR:5.10) was the risk factor for the elderly without cataracts17.
Sociodemographic questionnaire; MMSE; Activities of Daily Living (ADL); Instrumental Activities of Daily Living (IADL); Educational booklet;Game of memory does not fall istepô; game of memory fell of mature.	Light-hard technology.	The application of gerontotechnology resulted in self-care, empowerment and knowledge through the game, revealing interest in behavior change, independence and learning on the part of the elderly, in addition to serving as an instrument that facilitates care [18].
Structured instrument referring to socioeconomic data and the occurrence of falls; AVD; IADL; Short *Physical Performance Battery (*SPPB) and *Falls Efficacy Scale-International* (FES-I).	Light-hard technology.	The incidence of falls in the follow-up period represented 37.1%, being 20% recurrent and 17.1% in a single event. The final model indicated that the increase in one SPPB unit decreased by approximately 15% and 17%, respectively, the chance of falls and recurrent falls 19.
Questionário *Falls Risk Awareness Questionnaire* (FRAQ-Brasil).	Light-hard technology.	The interviewees were mainly female (58.4%), and income of 2 minimum wages (46.3%); the average of correct answers in the FRAQ-Brazil questionnaire was 19.5 in up to 32 points and the elderly interviewed were exposed, on average, to 7.8 household risk factors such as: lighting, safety bars, slippery floors, height of furniture, obstacles on the way, long clothes and safe shoes; Of the elderly, 180 (26.2%) said they had already received information about falls 20.
Questionário sociodemográficos; *Edmonton Frail Scale*; Yesavage Geriatric Depression Scale; TUG.	Light-hard technology.	The factors that were associated with the occurrence of falls were: female gender (OR=1.67; CI95%:1.13-2.47); negative self-perception of health (OR=1.49; CI95%:1.02-2.20); impairment of functional mobility (TUG test > 20 seconds) (OR=1.66; CI95%:1.02-2.74); the record of hospitalization in the previous 12 months (OR=1.82; CI95%:1.17-2.84); and frailty measured by the *Edmonton Frail Scale* (OR=1.73; CI95%:1.14-2.64)[21].
Frailty phenotype: influence of each item in the determination of frailty in community-dwelling elderly. Palmar Grip Force (FPP).	Light-hard technology. and Hard Technology.	The frailty components for risk factors for falls were: (1) reduction in strength and grip (no falls = 21.8%; falls = 31.5%; hazard ratio – RR = 1.44; and p = 0.003); and (2) exhaustion (no falls = 7.6%; falls = 14.7%; RR = 1.93; and p = 0.003)[22].
Questionnaire regarding clinical and sociodemographic characteristics and functional balance and mobility; seated tests for standing, semi-tandem, step test and gait speed of six meters.	Light-hard technology.	The occurrence of falls was associated only with the variable "gender", and the chance of falling was higher among women. The cutoff points for the sitting-to-standing, step test and gait speed tests were 8.5 seconds, 7.5 seconds and 0.98 m/s, respectively23.
Fall Risk Tracking Tool (FRRISque).	Light-hard technology.	Most of the elderly were female (57.6%), with a mean age of 71.87 years. In the logistic regression analyses, it was evidenced that only 10 items of the FRRIS that contribute to the increased risk of falls in the elderly and refer to the risk factors previous fall, use of gait aid device, polypharmacy, use of psychotropic drugs, difficulty to go up or down a slope, difficulty to walk 100 meters, visual and auditory deficit, low physical activity and poorly lit environment. This risk stratification model assumes sensitivity values of 91.3% and specificity of 73.4%[24].
Information about lifestyle habits was obtained; health conditions; use of medications; basic activities of daily living (BADL); instrumental	Light-hard technology.	The frequency of falls was 24.3%. After adjustments, there were higher chances of falling among women (OR = 3.10; CI95% 1.79–5.38), among people aged 65 years or older (OR = 2.39; CI95% 1.45–3.95), with poor sleep quality

activities of daily living (IADL); and sleep quality by the Pittsburgh Index (PSQI).		(OR = 1.78; CI95% 1.08–2.93) and with low handgrip strength (OR = 2.31; CI95% 1.34–3.97)[25].
Questionário sociodemográfico; *Clinical falls risk assessmet from*	Light-hard technology.	Incidence of 36.41% of falls in the elderly, of the elderly who fell and suffered fracture (18.67%), 50% had already suffered an episode of stroke and 50% had chronic kidney disease, and 61.54% stopped performing their daily activities after the fall26.
Questionário sociodemográfico; *Risk score de Downton*.	Light-hard technology.	The study included elderly people aged 60 to 93 years. Of these, 136 (59.7%) females and 92 (42.3%) males predominated in the study elderly hypertensive (55.7%) and diabetic (33.8%) with a history of falls (36.41%) in the last twelve months, with the use of medication, with sensory deficits and without gait alteration7.
Mini-Mental State Examination (MMSE), Timed Up and Go Test (TUG) and Edmonton Frailty Scale (EFE), instrumental activities of daily living (IADL) was assessed by the Lawton and Brody Scale	Light-hard technology	The prevalence of low, moderate and high risk of falls was 36%, 43.7% and 20.3%, respectively. The variables associated with moderate risk of falls were female gender, age between 71-80 years and >80 years. Age >80 years, negative self-perception of general health, need for help to walk through an assistive device, human assistance and fear of falling remained associated with high risk [27].
Berg scale.	Light-hard technology	It was found that in the group of dance practitioners (case) only one of them had a score lower than 45, and in the group (control) ten users had a value lower than 45. The calculated relative risk was 0.2, demonstrating that the practice of ballroom dancing was a protective factor against falls [28].
Advanced Activities of Daily Living (ADLs), Instrumental Activities of Daily Living (IADLs), Physical Activity based on items from the Minnesota Leisure Activity Questionnaire.	Light-hard technology	The prevalence of insomnia and daytime nap symptoms was 49.9% (n = 339) and 62.8% (n = 432), respectively. Fourteen to four percent reported a single fall and 11.9 percent reported recurrent falls. The occurrence of falls was associated with female gender (OR = 7.73; CI95%: 3.03-19.72), age > 80 years (OR = 3.48; CI95%: 1.54-7.85), daytime nap (OR = 2.24; CI95%: 1.24-4.05) and depressive symptoms (OR = 1.98; CI95%: 1.11-3.53) [29].
Short Physical Performance Batteryii (SPPB), basic activities of daily living (BADL), using the Katz Index, instrumental activities of daily living (IADL) and evaluation of advanced activities of daily living (AADL)	Light-hard technology	It was found that 24.7% of the elderly had falls in the last 12 months. The largest proportion of the elderly who suffered falls was female (p=0.004); aged 80 years or more (p=0.001); no schooling (p=0.026); lived alone (p=0.049); without a partner (p=0.002); with negative self-perception of health (p<0.001); dependent for BADL (p=0.049) and IADL (p=0.027); with lower participation in AADL (p=0.003); pre-frail/frail (p<0.001) and with low/poor physical performance (p<0.001). The largest clusters of occurrences of falls were in the central-western region of the municipality, followed by the southeast region [30].

Source: Own elaboration.

4 DISCUSSIONS

In the analysis and grouping of recurrent results, three guiding axes were defined, which included: use of health technologies to mitigate the risk of falling; internal and external risk factors for the occurrence of falls; and knowledge about falls as a preventive measure.

4.1 USE OF HEALTH TECHNOLOGIES TO MITIGATE THE RISK OF FALLS

The technologies in the health area can be subdivided into three categories: light technology, which is based on relational technologies, such as welcoming with qualified listening for the

implementation of care; light-hard technology, which is based on the use of structured knowledge, not requiring high technology for operationalization; and hard technology that qualifies through the use of technological equipment to perform care31.

The strategies identified to measure the propensity of falls in the elderly in communities identified in the selected articles used mild hard technologies in fourteen of the studies; however, hard technology was concomitantly associated in three studies16,17,22.

The technologies classified as mild-hard were represented by the use of questionnaires regarding the risks of falling, sociodemographic data associated with the risk of falling and physical activities without the use of technological devices7,14-24,26,31.

In the planning of health care at the various levels of health care, the use of light-hard technology is essential for the prevention of falls, since this technological level is concretized by the use of structured knowledge, through the analysis of the individual's health and the contribution of current scientific evidence [32].

In the scope of hard technologies, it was evidenced the use of technological equipment such as the hydraulic dynamometer that analyzes the Palmar Grip Force (FPP) and the Biodex Balance System Balance Platform for the analysis of the postural control of the individual16,17. The Biodex Balance System is an equipment that was used in one of the literatures in order to measure the postural control of the elderly17. The equipment data are obtained by projecting the center of mass within the support base of the device, which determines the postural oscillations and the balance deficit, through the displacement of the individual's center of pressure on the platform, where the elderly remain erect during the evaluation33,17, which can be shown as an ally to analyze the potential risk of falls in the elderly and direct the elaboration of strengthening exercise plan in a multidisciplinary way to avoid its occurrence.

Regarding the Palmar Grip Strength (PPF), a technique used in two studies and is measured by means of a hydraulic dynamometer, capable of measuring the force produced by a maximum isometric contraction, recorded in kilograms16. The test is evaluated in the orthostatic posture, with the elbow flexed at 90º and other joints in neutral positions16. One of the literatures showed an association between the reduction of PPF and sarcopenia, with consequent loss of muscle mass and strength of the individual22. Thus, in the aging process of the human being, the appearance of this morphophysiological alteration is contacted, causing reduced balance, loss of agility and increased risk of falling22.

The use of technological resources in the management of care helps in the identification and monitoring of possible changes or risk factors to the health of the population, qualifying the methods of screening for comorbidities and reducing the incidence of diagnostic errors8.In the meantime, the use of hard technology in the identification of factors associated with the risk of falls evidences

possible morphofunctional changes arising from the senescence process, which can corroborate the incidence of falls, enabling early implementation of prevention strategies and improvements in the quality of life of the elderly2,7.

Although the isolated use of light technology has not been verified, it is reiterated that welcoming and qualified listening help communication between the health team and the patient, enabling better effectiveness in the promotion of care34, and can also help in obtaining greater adherence to the care plan. In this sense, it is considered that although light technology has not been used directly in the researches listed, it can be presented as an ally to the collective planning of an individualized care, appropriate to the needs of the individual.

4.2 EXTERNAL AND INTERNAL RISK FACTORS FOR THE OCCURRENCE OF FALLS

The risk factors related to the fall of the elderly identified in the studies can be subdivided into two groups, which includes those internal or intrinsic to the individual, represented by variables such as gender, advanced age, chronic and acute comorbidities, depression and reduction of muscle mass; and the external/extrinsic ones, referred to environmental factors such as irregular surfaces, slippery floor, inadequate lighting, and staircase without handrail21,17,19.

The estimation of the risk of falls in the elderly can be complex because it derives from external and internal factors with multifactorial categorization, as already discussed in the literature. Due to this difficulty in measuring the risk of falling, one of the studies showed that the best tactic to reduce the incidence of falls is to identify and neutralize their risk factors7. In this purpose, the identification of risk factors can be understood as a strategy for preventing/monitoring the risk of falls in the elderly. Thus, several studies employ scales/instruments for its identification, as observed in this RIL.

It is worth mentioning that the findings of two of the studies stated that extrinsic factors are associated with a single occurrence of falls, while intrinsic factors may have repercussions on the recurrence of falls in the elderly21,19. In this perspective, it is confronted with a challenge for the multiprofessional practice in health in the prevention of falls, since the intrinsic factors are mostly non-modifiable.

In the scope of sociodemographic variables, two studies17,19 have a higher incidence of falls in the gender variable, indicating that elderly females are four times more likely to fall than males, with a greater predisposition to fall and recurrence of the event17,19. The finding of the association of the gender variable was evidenced in the use of the Lawton and Brody *scale* for Activities of Daily Living (ADL), which was used in four of the studies [16-18,24]. In this scale are included questions such as: "are you able to use the phone?" and "are you able to control your finances?" The three answer options refer to the degree of autonomy/dependence to perform ADLs, resulting in a maximum final score of 27 points (good autonomy) and a minimum of nine points (dependence ratio)[35].

In relation to cataracts as an intrinsic factor for the risk of falling, a study with the objective of evaluating the factors associated with falls in community-dwelling elderly with a diagnosis of cataracts, the use of ADL denoted a higher score than in the group of patients without the pathology, indicating that although visual impairment may cause difficulties to detect obstacles, The risk of falls should be associated with other sensory impairments involving balance16. Corroborating this finding, one of the articles discusses the loss of balance, denoting that the decrease in the ability to balance should be considered as a frailty in the elderly, since it has repercussions in an increase in the risk of falling21.

The loss of balance, functional capacity and autonomy in daily activities were the intrinsic risk factors most investigated by the articles listed. The Katz Index, which assesses Instrumental Activities of Daily Living (IADL), was applied together with ADL and this association occurred in four literatures17-19,25. The IADL is composed of 8 topics with the objective of evaluating the autonomy of the individual in daily activities, which: preparing meals, washing clothes, handling money, using the telephone device, taking medications, shopping and using the means of transportation32,25.

Regarding the *Timed Up and Go* (TUG) test, its execution was evidenced in three of the literatures15,19,14. The test is intended to assess balance and functional capacity for gait and risk of falls, supported by physical tests, which include: getting up from a chair with arms, walking three meters ahead, turning, walking back and sitting in the chair, with results equal to or greater than 20 seconds suggestive of more difficult mobility for the elderly and consequently indicate a higher risk of falls [17,16].

The investigations carried out in two of the studies related to the TUG denote that elderly people who practice physical activity improve their scores in postural balance tests and mitigate the time of performance of the test, presenting a better score and a reduction in the risk of falling15,14. Corroborating this assertion, studies indicate that the practice of physical exercises promotes greater body coordination that provides satisfactory balance, and therefore contributes to the reduction of the incidence of falls, chronic pathologies and cardiac risks [36,5].

The Stand Up and Sit Chair (LSC) test was performed in two of the studies, which found no relationship between the LSC and the occurrence of falls15,24. It is worth mentioning that this test is able to assess the level of muscle strength in the lower limbs of the elderly, who should stand up and sit five times from a chair, as soon as possible, without the help of the upper limbs, which remained crossed in front of the body during the movement23.

The application of the Minnesota Leisure Time Activities Questionnaire in the elderly was used in one of the studies, composing 16 questions about weekly frequency and daily duration of physical activities performed by the elderly. The research considered active those who performed at least 150

minutes of weekly physical activity of moderate intensity exercises, or 120 minutes of vigorous intensity physical activity, individuals who did not meet these criteria were considered sedentary29.

In the scenario of evaluation of motor physical aptitudes, the *Short Physical Performance Battery* (SPPB) test was applied in two of the studies, evaluating the physical capacity of the lower limbs, and showed that elderly with a low score were 3.5 times more likely to fall than those who obtained high scores15. The SPPB uses 3 topics in its evaluation, namely: balance, gait speed and sitting and getting up from the chair. Its evaluation results in a score from 0 to 12, establishing that from 0 to 3 points (disability); 4 to 6 points (low performance); 7 to 9 points represents moderate performance and 10 to 12 points (good performance)[16,18].

One of the studies applied the Berg scale, which is a functional balance assessment instrument composed of 14 delegations, with five items and scores from 0 to 4 for each task: 0 points (inability to perform the task) and 4 (performs the task independently). The total score ranges from 0-56 points, evidencing that individuals with a score lower than 45 have a greater propensity to fall[28].

Four studies address the use of the mini mental state examination (MMSE) as an instrument for the cognitive screening of the elderly15-17 that qualifies five areas of cognition: orientation; recording; attention and calculation; recall and language. The maximum score of the instrument is 30 points, influenced by the individual's education and for this it presents different cutoff points, illiterate (13 points), low/medium schooling (18 points) and high schooling (26 points)19,37. The MMSE is essential for the application of other instruments/questionnaires used in the studies, since a reduction in the cognitive capacity of the elderly may result in answers that do not match the reality of the individual, generating research biases16,15.

The Geriatric Depression Scale (GDS) was used in two articles, and is presented with 15 items that reflect one of the main ways of screening for depressive symptoms in the elderly. Both literatures found no relationship between the presence of depressive symptoms and the occurrence of falls16, 21.

The Pittsburgh Index (PSQI) seeks to track and evaluate the quality of sleep of individuals, consisting of 19 self-report questions categorized into seven components, graded in scores from 0 (no difficulty) to 3 (severe difficulty)[34]. The PSQI was used in one study, contacting those individuals with a low *score* had poor sleep quality, associated with higher chances of falling risk25. Evidence corroborates the previous assertion, since poor sleep quality may be associated with decreased daytime performance, contributing to the occurrence of falls38.

The *Downton risk scale* was used in two of the investigations and deals with the risk of falling in the elderly with a score from 0 to 11, and scores greater than or equal to 3 represent a higher risk of falling7,14. In this evaluation, five criteria are used, which: (1) previous falls: responsible for evidencing if the elderly have already suffered any fall; (2) medications: seeks to produce a survey in order to measure whether the elderly use medications; (3) sensory deficit: evaluates whether the elderly

have any type of deficit; (4) mental state: informs the mental state of the individual, informing if he is oriented and aware of information regarding time and space and (5) gait: denotes the individual's walking process delimiting a type of gait39.

And finally, the Fall Risk Tracking Tool (FRRISque), seeks to track and identify people with a higher risk of falling in a comprehensive way. The cataloguing of people in the community with lower and higher risk of falls can trigger a more complete and detailed evaluation, addressing risk factors, whether biological, behavioral, social and economic22. The FRRISwhich was used in one of the studies, showing that elderly people with decline in the auditory process and with postural alteration are more susceptible to falls22.

In view of the screening of risk factors for the occurrence of falls, the use of several measurement tools/instruments was verified, which were related to the identification and association of internal and external factors to the elderly.

4.3 KNOWLEDGE ABOUT FALLS AS A PREVENTIVE MEASURE

The *Falls Efficacy Scale-International* (FES-I) was applied in two studies [17], [14]) and is able to measure the level of concern of the patient in the execution of daily activities by grading the *Likert* scale, ranging from 1 (not slightly worried) to 4 (extremely worried) [35]. The application of FES-I in the studies found that scores higher than 24 were indicative of the risk of future falls18,40,41.

The Falls Risk Awareness Questionnaire (FRAQ), which assesses the perception of the elderly regarding the risk of falls, was used in two studies18,15. The FRAQ score presents a variable from 0 to 32 in its score, and the higher the score of the elderly, the better the awareness about the risk factors and prevention of falls16. In this sense, the low score in the two scales mentioned above does not reflect in a lower risk of falls, but in a lower body awareness when confronted with other contributing factors and can direct the professional to carry out a health education process focused on the prevention of falls.

The two literatures denoted the low knowledge regarding risk factors for falls in elderly people, associated with a higher number of falls at home in the patient's history20,14. In this scenario, active aging aims to optimize health through strategies to promote healthy aging, which should be based on health education, since knowledge has repercussions on a process of autonomy of the individual, minimizing the incidence of comorbidities5.

In the perspective of the acquisition of knowledge about the risk of falling, in a study the method of gerontotechnologies was used, through the dissemination of an educational booklet, memory game, game does not fall istepô and game entitled fell of mature, with simultaneous application of the strategies with the measurement scales of the MEEM, TUG, AVD and IADL, that evaluated the effectiveness of the gerontotechnology processes, evidencing the greater self-care of the

elderly, with interest in interventions to reduce the risk of falls and the incidence of this event in the population studied18.

Faced with a scenario in which falls are characterized as a multifactorial event, multiple interventions that associate different methodologies/technologies in order to mitigate the incidence of falls in the elderly18 supply its multifactorial character and were evidenced as essential tools for the prevention of falls in the elderly. The instruments used in this thematic axis show that the context of low knowledge regarding the risk factors of falls and may be associated with a greater number of falls in the elderly.

As a limitation of this study, it is pointed out the scarcity of materials corresponding to the technologies adopted for the prevention of falls in the elderly population in communities, with the use of the descriptors listed. It is recommended to expand the methods of reviews in search of the association of the effectiveness of the use of health technologies with the prevention of falls. However, the present study can contribute to the monitoring and/or formulation of strategies based on scientific evidence, in vogue the mitigation of falls of the elderly in communities.

5 FINAL CONSIDERATIONS

The RIL made it possible to highlight the technologies adopted to prevent the risk of falls in the elderly population in communities with the predominant use of light-hard and hard technology. In addition, external and internal risk factors for the occurrence of falls and knowledge about the risks of falls as preventive measures were verified.

In view of the risk factors for falls, the intrinsic factors related to the loss of balance, muscle mass and strength stand out, as well as the knowledge regarding the risk of falling. In this perspective, the association of physical practices in order to promote increased body coordination and the acquisition of knowledge about strategies to reduce the risk of falling, as observed in the adoption of multiple intervention, enabled greater autonomy of the elderly in their self-care.

REFERENCES

1. United Nations (EUA). Department of Economic and Social Affairs, Population Division (2019). World Population Prospects: The 2019 Revision, Key Findings and Advance Tables. Disponível em: https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/files/documents/2020/Jan/wpp2019_highlights.pdf

2. Secretaria de Estado da Saúde do Paraná (BR). Superintendência de Atenção à Saúde. Linha guia da saúde do idoso. Curitiba: SESA, 1 ed., 2017. Disponível em: http://www.saude.pr.gov.br/arquivos/File/linhaguia_idoso.pdf

3. Matos FS, Jesus CSD., Carneiro JAO, Coqueiro RS, Fernandes MH, Brito TA. Redução da capacidade funcional de idosos residentes em comunidade: estudo longitudinal. Ciência & Saúde Coletiva, 2018; 23(10):3393-01. Disponível em: https://www.scielosp.org/article/csc/2018.v23n10/3393-3401/pt/

4. Kagawa CA.; Corrente JE. Análise da capacidade funcional em idosos do município de Avaré-SP: fatores associados. Revista Brasileira de Geriatria e Gerontologia. 2015;18(3):577-586. Disponível em: https://repositorio.unesp.br/handle/11449/158196

5. Ministério Da Saúde (BR). Secretaria de atenção à saúde departamento de ações programáticas estratégicas. Caderneta De Saúde Da Pessoa Idosa. Brasília, DF, 2017. 4 ed. Disponível em: http://portalarquivos2.saude.gov.br/images/pdf/2017/setembro/27/CADERNETA-PESSOA-IDOSA-2017-Capa-miolo.pdf Acesso em: 13 dez. 2019.

6. Ministério Da Saúde (BR). Política Nacional de Saúde da Pessoa Idosa. PORTARIA Nº 2.528 DE 19 DE OUTUBRO DE 2006. Brasília, DF, 2006. Disponível em: https://bvsms.saude.gov.br/bvs/saudelegis/gm/2006/prt2528_19_10_2006.html Acesso em: 20 dez. 2019.

7. Sardinha AHL, Cantanhêde NLC. Quedas em idosos: avaliação dos fatores de risco. Nursing (São Paulo); 2018; 240(21):2160-2163. Disponível em: http://www.revistanursing.com.br/revistas/240-Maio2018/saude_idoso.pdf

8. Boava LM.; Weinert WR, Tecnologia em saúde uma reflexão necessária. Revista Mundi Engenharia, Tecnologia e Gestão, 2020; 5(3): 243-01. Disponível em: http://consup.ifpr.edu.br/index.php?journal=MundiETG&page=article&op=view&path%5B%5D=1246&path%5B%5D=517

9.Mendes KD, Silveira RC, Galvao CM. Revisão integrativa: método de pesquisa para a incorporação de evidências na saúde e na enfermagem. Texto Contexto Enferm. 2008;17(4):758-64. Disponível em: https://www.scielo.br/scielo.php?pid=S0104-07072008000400018&script=sci_arttext

10. Ministério Da Saúde (BR). Institui o Programa Nacional de Segurança do Paciente (PNSP). PORTARIA Nº 529, DE 1º DE ABRIL DE 2013. Brasília, DF, 2013. Disponível em: http://bvsms.saude.gov.br/bvs/saudelegis/gm/2013/prt0529_01_04_2013.html

11. Ursi ES, Gavão CM. M. Prevenção de lesões de pele no perioperatório: revisão integrativa da literatura. Rev. Latino-am Enfermagem 2006 janeiro-fevereiro; 14(1):124-31. . Disponível em: https://www.scielo.br/pdf/rlae/v14n1/v14n1a17.pdf

12.Caldwell K., Henshaw L., Taylor, G. Desenvolvendo uma estrutura para criticar a pesquisa em saúde: uma avaliação precoce. Nurse Education Today, 2011;31(8):1–7, Disponível em: doi: 10.1016 / j.nedt.2010.11.025

13. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71.

14. Silveira MB, Saldanha RP, Leite JCD. Construção e validade de conteúdo de um instrumento para avaliação de quedas em idosos. Einstein (São Paulo), 2018,16(2),. Disponível em: https://www.scielo.br/scielo.php?pid=S1679-45082018000200207&script=sci_arttext&tlng=pt

15. Mamani ARN. Reiners AAO, Azevedo RCS. Cuidador de idosos: conhecimentos, atitudes e práticas sobre quedas e sua prevenção. Rev. Bras. Enferm. Brasília. 2019;72(2):119-126. Disponível em: https://www.scielo.br/scielo.php?pid=S00347167201900080011 9&script=sci_arttext&tlng=pt

16. Silva VMD, Arruda ASFD, Silva LDSV. Efetividade de uma intervenção múltipla para a prevenção de quedas em idosos participantes de uma Universidade Aberta à Terceira Idade. Revista Brasileira de Geriatria e Gerontologia, 2019; 22(4). Disponível em: https://www.scielo.br/scielo.php?pid=S180998232019000400204&script=sci_arttext&tlng=pt

17. Paz LPDS, Borges LDL., Marães VRFDS. Fatores associados a quedas em idosos com catarata. Ciência & Saúde Coletiva. 2018;23(8): 2503-2514. Disponível em: https://www.scielosp.org/article/csc/2018.v23n8/2503-2514/

18. Ferreira JM., Hammerschmidt KSA, Siewert JS. Gerontotecnologia para prevenção de quedas dos idosos com Parkinson.Rev. Bras. Enferm. Brasília, 2019; 72(2):243-250,. Disponível em: https://www.scielo.br/scielo.php?pid=S0034-71672019000800243&script=sci_arttext&tlng=pt

19. Souza AQD., Pegorari MS, Nascimento JS, Oliveira PBD.
Incidência e fatores preditivos de quedas em idosos na comunidade: um estudo longitudinal. Ciência & Saúde Coletiva, 2019;24 (9):3507-3516,. Disponível em: https://www.scielosp.org/article/csc/2019.v24n9/3507-3516/pt/

20. Chehuen Neto JA., Braga NAC, Brum IV. Percepção sobre queda e exposição de idosos a fatores de risco domiciliares. Ciência & Saúde Coletiva, 2018; 23(4):1097-1104. Disponível em: https://www.scielosp.org/article/csc/2018.v23n4/1097-1104/

21. Carneiro JA., Ramos GCF., Barbosa ATF. Quedas em idosos não institucionalizados no norte de Minas Gerais: prevalência e fatores associados. Revista Brasileira de Geriatria e Gerontologia, 2016;19(4):613-625.Disponível em: https://www.redalyc.org/pdf/4038/403847457006.pdf

22. Duarte GP, Santos JLF, Lebrão ML. Relação de quedas em idosos e os componentes de fragilidade. Revista Brasileira de Epidemiologia, 2019; 21(2). Disponível em: https://www.scielosp.org/article/rbepid/2018.v21suppl2/e180017/

23. Castro PMMA, Magalhães, AMD, Cruz, ALC. Testes de equilíbrio e mobilidade funcional na predição e prevenção de riscos de quedas em idosos. Revista Brasileira de Geriatria e Gerontologia. 2015;18(1):129-140. Disponível em: https://www.scielo.br/scielo.php?pid=S180998232015000100129&script=sci_arttext&tlng=pt

24. Chini LT, Pereira DS, Nunes AA. Validação da Ferramenta de Rastreio de Risco de quedas (FRRISque) em pessoas idosas que vivem na comunidade. Ciência & Saúde Coletiva, 2019;24 (8):2845-2858,. Disponível em: https://www.scielosp.org/article/csc/2019.v24n8/2845-2858/

25. Prato SCF, Andrade SMD, Cabrera MAS. Frequência e fatores associados a quedas em adultos com 55 anos e mais. Revista de Saúde Pública, 2017; 51(1):37. Disponível em: https://www.scielosp.org/article/rsp/2017.v51/37/pt/

26. Alves RLT, Moreira CF, Pimentel, LN, DE Azevedo CI, Santos SC, Coelho LAF, Avaliação dos fatores de risco que contribuem para queda em idosos. Revista Brasileira de Geriatria e Gerontologia, 2017;20(1):59-69. Disponível em: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S180998232017000100056&lng=en&tlng=en

27. Fioritto AP., Cruz DTD., Leite ICG. Prevalência do risco de queda e fatores associados em idosos residentes na comunidade. Rev. bras. geriatr. Gerontol, 2020; 23(2):e200076. Disponível em: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S1809-98232020000200206&lang=pt

28. Pereira PE, Bolpato LF,Mendonça MS. Dança de salão na prevenção de quedas em idosos: estudo caso controle. Revista Cuidarte, 2019; 10(3):1-9. Disponível em: http://www.scielo.org.co/scielo.php?script=sci_arttext&pid=S2216-09732019000300209&lang=pt

29. Pereira AA, Ceolim MF, Neri AL. Associação entre sintomas de insônia, cochilo diurno e quedas em idosos da comunidade. Cadernos de Saúde Pública 2013 29(3): 535-546. Disponível em: https://www.scielosp.org/article/csp/2013.v29n3/535-546/

30.Sousa AD, Ingrid VC, Gomes N., Santos NJ, Neves RRCC, dos Santos TDM. Queda entre idosos: preditores e distribuição espacial. Revista de Salud Pública, 21 (2020): 187-194. Disponível em: https://www.scielosp.org/article/rsap/2019.v21n2/187-194/

31. Sabino LMM, Brasil DRM, Caetano JÁ.. Uso de tecnologia leve-dura nas práticas de enfermagem: análise de conceito. Aquichan, 2016;16(2):230-239. Disponível em: https://www.redalyc.org/pdf/741/74146013010.pdf

32. Barbosa, BR, Almeida JMD, Barbosa MR, Rossi-Barbosa, L. A. R. Avaliação da capacidade funcional dos idosos e fatores associados à incapacidade. Ciência & Saúde Coletiva, 2014;19(8):3317-3325. Disponível em: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S1413-81232014000803317

33. Lúcio HA. Análise da correlação entre Biodex Balance System e Wii Balance Board para avaliação do controle postural em idosos: estudo piloto. 2018. Disponível em: https://bdm.unb.br/bitstream/10483/20654/1/2018_HeloisaArakakiLucio_tcc.pdf

34. Rolim K., Santos M., Magalhães F. O uso de tecnologia leve na promoção da relação enfermeira e pais na UTI Neonatal**.** CIAIQ**.** 2017;2. Disponível em: https://www.proceedings.ciaiq.org/index.php/ciaiq2017/article/view/1263/1223

35. Dos Santos RL, Júnior JSV. Confiabilidade da versão brasileira da escala de atividades instrumentais da vida diária. Revista Brasileira em Promoção da Saúde, 2008;21(4):290-296. Disponível em: https://www.redalyc.org/pdf/408/40811508010.pdf

36. Fernandes AMBL, De Almeida FJJ, Stolt LROG. Efeitos da prática de exercício físico sobre o desempenho da marcha e da mobilidade funcional em idosos. Fisioterapia em Movimento. 2017;25(4). Disponível em: https://periodicos.pucpr.br/index.php/fisio/article/view/21475

37. Folstein MF, Folstein SE. Mchugh PR. Mini-mental state": a practical method for grading the cognitive state of patients for the clinician. Journal of psychiatric research, 1975;12(3):189-198. DOI: 10.1016/0022-3956(75)90026-6

38.Araujo PABD, Sties SW., Wittkopf PG. Índice da qualidade do sono de Pittsburgh para uso na reabilitação cardiopulmonar e metabólica. Revista Brasileira de Medicina do Esporte, 2015;21(6):472-475. Disponível em: https://www.scielo.br/scielo.php?pid=S1517-86922015000600472&script=sci_arttext

39. Pereira AA, Ceolim MF. Relação entre problemas do sono, desempenho funcional e ocorrência de quedas em idosos da comunidade. Revista Brasileira de Geriatria e Gerontologia, 2011;14(4):769-778. Disponível em: https://www.scielo.br/scielo.php?pid=S1809-98232011000400016&script=sci_arttext

40. Schiaveto FV., Avaliação do rico de queda em idosos na comunidade. Dissertação (Mestrado Enfermagem) Escola de Enfermagem de Ribeirão Preto, Universidade de São Paulo. Ribeirão Preto, 2008. Disponível em: https://www.teses.usp.br/teses/disponiveis/22/22132/tde-19122008-153736/publico/FabioVeigaSchiaveto.pdf

41. Camargos FO, Dias RCD, Dias JMD, Freire MTF. Adaptação transcultural e avaliação das propriedades psicométricas da Falls Efficacy Scale – Internacional em idosos brasileiros (FES-I-BRASIL). Rev Bras Fisioter. 2010;14(3): 237-243. Disponível em: http://www.scielo.br/pdf/rbfis/v14n3/10.pdf

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Artificial intelligence and mental health

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ABSTRACT
This article presents an overview of AI in mental health care, notably discusses its potential benefits, limitations, ethical implications, and future considerations for the use of AI in mental health care. Carrying out a reflection on the importance that this can have in the quality of life and mental health, emphasizing the uniqueness of the human being, its magical, unpredictability and creative capacity, concluding that AI should never replace the relationship, but on the contrary, be the support. In short, there is the need not to close the doors to reflection.

Keywords: artificial intelligence, mental health.

1 INTRODUCTION

1.1 ARTIFICIAL INTELLIGENCE

Artificial Intelligence (AI) was originally coined by computer scientist John McCarthy, who defined it as "the science and engineering of creating intelligent machines" (McCarthy, 2007). AI is a rapidly evolving computer science domain that involves the creation of machines and software capable of performing tasks that require human intelligence (Terra et al., 2023). These tasks reproduce human cognitive processes such as learning, reasoning, problem solving, pattern recognition, and predictive inference (D'Afonso, 2020). It can be implemented through hardware or software, in autonomous or distributed systems, and can also manifest as intelligent autonomous agents capable of interacting with their environment and making decisions (Luxton, 2016). Artificial Intelligence can be divided into "weak" AI, designed for specific tasks, and "strong" AI, capable of performing any intellectual task a human being can perform (Terra et al., 2023).

There are already several investigations that suggest that AI may perform as well, or better than that of humans in essential health care tasks, such as diagnosing diseases (Davenport & Kalakota, 2019). Due to the increasing complexity and abundance of data in healthcare, artificial intelligence (AI) is being used more frequently in this domain (Davenport & Kalakota, 2019).

Research on mental health and artificial intelligence (AI) has been increasing rapidly, with deep learning (DL) and machine learning (ML) playing a promising role in the detection of mental illness,

diagnosis, prognosis, treatment support, public health, and clinical research and administration (Zhou et al., 2022). According to Lee et al. (2021), the global burden of mental illness is significant and the shortage of mental health care providers is a major challenge. In this regard, AI can help mitigate this shortage, and the global healthcare AI market is expected to grow significantly.

1.2 USEFULNESS AND BENEFITS

Artificial Intelligence promises to revolutionize diverse sectors of society, including healthcare, transportation, education, and finance, by enabling machines to perform advanced human-like tasks (Abrams, 2021). In mental health services, AI has the potential to support these services by enabling the identification and monitoring of mental health problems in individuals and populations (World Health Organization, 2023).

Applications of Artificial Intelligence in healthcare primarily focus on diagnostic and treatment recommendations, patient engagement and adherence, and administrative tasks (Davenport & Kalakota, 2019). Given the high prevalence of psychiatric disorders and the shortage of mental health care providers, AI has the potential to identify high-risk individuals, provide interventions, and improve the prevention and treatment of mental illness (Lee et al., 2021). Even chatbots, also known as conversational agents or virtual assistants, are gaining interest as a potential mental health tool that offers two benefits: psychoeducation and improved treatment adherence (Vaidyam et al., 2019).

Unlike humans, machines are not affected by factors such as fatigue, burnout or forgetfulness, in this sense, AI offers numerous advantages in performing complex tasks, demonstrating greater efficiency, accuracy and reliability (Luxton, 2016). AI can also be used in monitoring, treatment, prevention, diagnosis, and deep learning by analyzing data from various sources such as wearable devices, electronic health records, and self-reports (Terra et al., 2023).

AI has significant potential to help identify biomarkers and develop better pre-diagnostic screening tools and risk models, it can also contribute to the personalization of mental health care as a long-term goal (Graham et al., 2019). These machines can be programmed with a wide range of evidence-based approaches and administer the most appropriate therapy based on a patient's diagnosis, preferences or treatment progress, as well as increase efficiency and cost-effectiveness (Luxton, 2016; Terra et al., 2023).

Internet-based adjuvant interventions, specifically designed for young people, can be a cost-effective and engaging alternative to avoid losing the benefits of the intervention, as the benefits of these early mental health interventions may not be maintained over time and long-term intervention programmes may be needed to maintain the initial clinical gains (D'Alfonso et al., 2017). Similarly, by harnessing the benefits of social media and examining speech patterns, AI has the potential to aid in the detection of emotional distress and suicidal thoughts, enabling timely support (Terra et al., 2023).

At the societal level, the application of AI technology in care delivery could produce substantial reductions in the long-term costs associated with untreated mental health and behavioural problems (Luxton, 2016).

In short, AI technology offers several advantages, extracts meaning comprehensively from diverse data sources, improves understanding of the prevalence of mental illness and biological factors, monitors treatment progress, and enables remote therapeutic sessions (Graham et al., 2019). These advances also increase human potential in terms of creativity and functionality, increasing productivity (Luxton, 2016). However, artificial intelligence is not without risks (Abrams, 2021).

1.3 IMPLEMENTATION CHALLENGES

Despite strong investments, the implementation of AI in healthcare is still at an early stage (Aung et al., 2021), namely, its application in mental health care and neurobiological research has been limited (Lee et al., 2021). The use of AI in mental health research is still unbalanced, focusing primarily on depressive disorders, schizophrenia, and other psychotic disorders, leaving other mental health conditions understudied (World Health Organization, 2023).

The limited presence of AI in the sector to date and the difficulty of integrating AI into clinical workflows and electronic health record systems have been somewhat responsible for the lack of impact on employment (Davenport & Kalakota, 2019). Furthermore, studies indicate that while AI can help with data analysis and prognosis, it is not likely to fully replace mental health professionals due to the essential human elements in this domain, including empathy, understanding, and the therapeutic relationship with patients (Terra et al., 2023).

While AI can improve diagnostic accuracy and promote understanding of mental illness, the complexity and limitations of data in mental health care pose challenges to the implementation of AI (Lee et al., 2021). According to Aung et al. (2021), one of the main obstacles to implementing AI in healthcare is the availability and quality of data, which is often inconsistent, inaccurate, and lacks normalization, which can limit the scale and accuracy of AI algorithms. In this regard, it is essential that mental health professionals are involved in the development of AI technologies to ensure that algorithms are consistent with validated psychological practices (Abrams, 2021).

AI systems are only as unbiased as the data they are trained with, and if the data is biased, the AI system will perpetuate these trends (Terra et al., 2023). In addition to possible biased outcomes in AI models, data leakage is also a potential problem, with the risk that this information could be used for unintended purposes or accessed by unauthorized individuals (Aung et al., 2021; Terra et al., 2023).

As digital technologies and AI are adopted in mental health care new challenges arise, one of the main challenges is the lack of empirical evidence demonstrating the effectiveness of AI-based interventions in prospective clinical trials, as existing research is mostly preclinical and conducted in

artificial settings (Aung et al., 2021). Similarly, the use of AI in mental health diagnoses raises questions about who is responsible for the accuracy of diagnoses and how decisions are made (Terra et al., 2023). Therefore, it is critical to define clear guidelines for implementing AI and conducting empirical research to demonstrate its real-world benefits (Aung et al., 2021).

AI systems lack the ability to make compassionate, fair, and equitable decisions, fail to self-reflect, self-correct, or consider diversity of perspectives, ethics, and morality (Lee et al., 2021). In this sense, if not mediated, AI can aggravate ethical problems in mental health care, as it entails its own ethical issues, such as equity, inclusion, transparency, accountability, privacy, reliability, and security (D'Alfonso, 2020).

1.4 ETHICAL IMPLICATIONS

In the past, decisions regarding health care were made almost exclusively by humans and the use of intelligent machines to make them or help make them raises questions of accountability, transparency, authorization and privacy (Davenport & Kalakota, 2019). By its nature, mental health care is an area that raises specific ethical and legal considerations, as well as the need for regulation (D'Alfonso, 2020). Thus, the integration of ethics into the development of AI through research and education is necessary and requires adequate resources (Graham et al., 2019).

It is crucial to walk the way forward with the aim of harnessing the potential of AI to support mental health care, while simultaneously addressing the ethical and social implications associated with its use (Lee et al., 2021). It is critical to prioritise the well-being of individuals, alleviate suffering and act ethically and responsibly towards society (Luxton, 2016).

According to Aung et al. (2021), bad decisions made by AI can have serious consequences and therefore it is critical to ensure patient accountability, transparency, privacy and confidentiality when using AI in mental health (Terra et al., 2023).

Ethical concerns such as prejudice, privacy and transparency must be taken into account (Lee et al., 2021). Therefore, psychologists are playing a crucial role in the responsible development and implementation of AI, especially in the area of mental health, notably helping to adapt AI technologies to make them more effective and improve understanding of human behaviour (Abrams, 2021).

Addressing these ethical issues and participating in public debates can lead to the adoption of a universal ethical norm that prioritizes the well-being of patients and ensures a responsible use of AI in healthcare (Aung et al., 2021).

2 FUTURE CONSIDERATIONS

AI represents a paradigm shift, as knowledge and skills are embedded in intelligent machines (Luxton, 2016). It is seen as a key part of the next digital revolution in mental health, but it is important

to consider these issues for the success of its implementation (World Health Organization, 2023). Thus, as digital technologies and AI are adopted in mental health care, it becomes crucial to also explore the concept of therapeutic alliance in digital mental health, since this relationship between a therapist and a patient has a significant impact on therapy outcomes (D'Alfonso, 2020).

Successful integration of AI into mental health care requires careful consideration of stakeholder involvement during the development process, given that AI-based interventions should simplify and speed up processes, rather than increasing the complexity and burden of healthcare professionals (Aung et al., 2021). It is crucial to ensure validity, consider unobserved factors, assess data biases, and identify and mitigate AI errors (Graham et al., 2019).

The field of AI and psychological interventions has yet to be explored, and more research is needed to address the broader ethical and social concerns of these technologies to negotiate the best research (Zhou et al., 2022). It is important that healthcare institutions, as well as government bodies and regulators, create structures to monitor key issues, react responsibly, and establish governance mechanisms to limit negative consequences (Davenport et al., 2019). Collaboration between mental health professionals, ethicists, technologists, and administrators is also crucial to maximize the potential of AI (Luxton, 2016).

Cultivating wisdom requires uniquely human characteristics, such as consciousness, autonomy, and will (Lee et al., 2021). Human input remains crucial, as AI should complement, not replace, the skills and knowledge of healthcare professionals (Aung et al., 2021).

3 CONCLUSIONS

What distinguishes us from the rest of living beings is perhaps the ability to reflect, to create, to leave ourselves to put ourselves in the place of the other. The ability to imagine, to create from something or an idea, to be inspired by looking at a stone and from there to be able to create a castle, a sculpture, an artifact to attach to the chest an amulet, an offering to a loved one, a symbol of resistance, a symbol of struggle, a symbol of a love that is expected, a symbol of a love that is lived, of a love that has been lost, including self-love.

And this ability to connect what is real and what is imaginary, the past the present and the future, which is unique to us, this ability has no name, to try to fit it into any machine, in an application is to crush the human condition, the one that is not measured or defined, the one that cannot be walled off, under penalty of becoming robotic. The one that is not designed with WiFi connections, or Gigabits of memory in the cloud,

This cloud cannot be formatted or fit inside a button, because this cloud is the unique dust that constitutes us, that surrounds us, that becomes consonant with our internal, external experiences, our learning, our pains, our dreams, what we say and the unspeakable. Let's use Artificial Intelligence, but

let's be smart not to let ourselves be used by it. The best of us is not intelligence, it is Sentience. The therapeutic relationship, the clinical help has this portion of cloud, this portion of poetry that says everything without the need for any keyboard.

REFERENCES

Abrams, Z. (2021). The promise and challenges of AI. Monitor on Psychology, 52(8). https://www.apa.org/monitor/2021/11/cover-artificial-intelligence

Aung, Y., Wong, D., & Ting, D. (2021). The promise of artificial intelligence: a review of the opportunities and challenges of artificial intelligence in healthcare. British Medical Bulletin, 139(1), 4-15. https://doi.org/10.1093/bmb/ldab016

D'Alfonso, S., Santesteban-Echarri, O., Rice, S., Wadley, G., Lederman, R., Miles, C., Gleeson, J., & Alvarez-Jimenez, M. (2017). Artificial Intelligence-Assisted Online Social Therapy for Youth Mental Health. Frontiers in psychology, 8, 796. https://doi.org/10.3389/fpsyg.2017.00796

D'Alfonso, S. (2020). AI in mental health. Current Opinion in Psychology, 36, 112-117. https://doi.org/10.1016/j.copsyc.2020.04.005

Davenport, T., & Kalakota, R. (2019). The potential for artificial intelligence in healthcare. Future healthcare journal, 6(2), 94–98. https://doi.org/10.7861/futurehosp.6-2-94

Graham, S., Depp, C., Lee, E. E., Nebeker, C., Tu, X., Kim, H. C., & Jeste, D. V. (2019). Artificial Intelligence for Mental Health and Mental Illnesses: an Overview. Current psychiatry reports, 21(11), 116. https://doi.org/10.1007/s11920-019-1094-0

Lee, E. E., Torous, J., De Choudhury, M., Depp, C. A., Graham, S. A., Kim, H. C., Paulus, M. P., Krystal, J. H., & Jeste, D. V. (2021). Artificial Intelligence for Mental Health Care: Clinical Applications, Barriers, Facilitators, and Artificial Wisdom. Biological psychiatry. Cognitive neuroscience and neuroimaging, 6(9), 856–864. https://doi.org/10.1016/j.bpsc.2021.02.001

Luxton, D. D. (2016). An introduction to artificial intelligence in behavioral and mental health care. In D. D. Luxton (Ed.), Artificial intelligence in behavioral and mental health care (pp. 1–26). Elsevier Academic Press.

Terra, M., Baklola, M., Ali, S., & El-Bastawisy, K. (2023). Opportunities, applications, challenges and ethical implications of artifcial intelligence in psychiatry: a narrative review. The Egyptian Journal of Neurology, Psychiatry and Neurosurgery, 59: 80. https://doi.org/10.1186/s41983-023-00681-z

Vaidyam, A.N., Wisniewski, H., Halamka, J.D., Kashavan, M.S., Torous, J.B. (2019). Chatbots and Conversational Agents in Mental Health: A Review of the Psychiatric Landscape. The Canadian Journal of Psychiatry. 64(7): 456-464. https://doi.org/10.1177/0706743719828977

World Health Organization (2023). Artificial intelligence in mental health research: new WHO study on applications and challenges. World Health Organization, https://www.who.int/europe/news/item/06-02-2023-artificial-intelligence-in-mental-health-research--new-who-study-on-applications-and-challenges

Zhou S, Zhao J and Zhang L (2022). Application of Artificial Intelligence on Psychological Interventions and Diagnosis: An Overview. Frontiers in Psychiatry, 13:811665. https://doi.org/10.3389/fpsyt.2022.811665

SEVEN
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Alternatives of Non-hormonal therapy in the climacteric: A narrative review and promising new treatment

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ABSTRACT
There is an association between COVID-19 and an increased risk of thrombotic events. However, the incidence of such events changes due to the severity of the disease. The aim of this paper was to evaluate the effects of antithrombotic agents on thrombotic events caused by COVID-19. This is a systematic review, with descriptive qualitative evaluation, carried out between 05/28/2021 and 06/21/2021. Scientific articles were searched, from 2019 to 2020, in SciVerse Scopus, Web of Science, PubMed and SCIELO databases. As a result, it was possible to observe that the most commonly used drugs for prophylaxis, and therapeutic of thrombotic events, in patients with COVID-19 were low molecular weight heparin, unfractionated heparin, fondaparinux, oral anticoagulants, antiplatelet agents, argatroban, aspirin, rosuvastatin, vitamin K antagonists, alteplase and other unspecified oral anticoagulants, used in monotherapy or associated. The proposed therapeutic schemes are a variation of the dosage of the drugs used. The use of therapeutic dose (tAC) and prophylactic dose (pAC); tAC, pAC and intermediate dose (iAC); pAC and subtherapeutic dose (subtAC); pAC, subtAC, therapeutic dose of antiplatelet (tAP) and prophylactic dose of antiplatelet (pAP) were found. The drugs used, with the exception of aspirin, showed some type of beneficial response in the recovery of the patient with COVID-19. The best treatment used was therapeutic dosing with enoxaparin, argatroban, fondaparinux and oral anticoagulants. According to the articles evaluated in this review, promising results of the use of antithrombotic agents in C0VID-19 are observed, but more studies are needed.

Keywords: climacteric, treatment, symptoms.

1 INTRODUCTION

It is known that the climacteric is a period of transition, with variable duration and, undoubtedly, special for the biological cycle of the woman, which brings with it several hormonal influences influencing daily life and family and social relationships. According to the World Health Organization (WHO), the climacteric corresponds to the period of life of the woman between the end of the reproductive phase until senescence that, in general, varies from 40 to 65 years. In this period occurs menopause which is defined as amenorrhea for 12 months due to the end of hormone secretion

from the ovaries. In climacteric there is a decrease in fertility and, progressively, a decline in the production of estradiol by the ovary, although a certain hormonal balance is maintained by the greater production of androgens and their peripheral conversion into estrogen. Menopause is considered early when it sets in before the age of 40, and late after the age of 55. (ALVES, 2015; AMORIM, 2020; FEBRASGO, 2012).

The fall in female hormone production is a physiological process that occurs with age, occurring due to an increasing reduction in ovarian activity, which is responsible for the secretion of "female" hormones, especially estradiol, estrone and estriol. (POLONINI; et al, 2011) This process causes women in the climacteric to present some of the characteristic symptoms of climacteric syndrome, such as hot flashes or hot flashes, which are the most common symptoms, and are the main reason for seeking medical treatment, occurring in more than 50% of women in the period of menopause transition and may persist for a few years after menopause, in addition to these symptoms, there is insomnia, nervousness, depression, hypertension, urinary incontinence, dyspareunia (pain during sex) as a consequence of vaginal dryness, due to hypoestrogenism and many others (ALVES, 2015; Felix, 2009).

It is also important to be put that the clinical picture presented in the climacteric is not due only to hormonal reduction, because, associated with it, there are very important psychosocial factors, among them, there is the perception of aging that occurs in this phase, because in this period the woman begins to be seen as someone who is losing her youth and vitality, In this way, the woman seeks medical and aesthetic alternatives to promote her health and well-being, both physical and psychological. (POLONINI; et al, 2011)

It is known that women with low self-esteem have more symptoms and usually have a negative attitude in this period of life. Thus, these factors, together, can contribute to the reduction of quality of life, as well as lead to decreased productivity at work and difficulties in personal and social relationships. (VALADARES, et al., 2008) Most women, in this period, experience a crisis experienced by their female part, either in the maternal sphere or in their ability to seduce, helping in the development of the symptoms already mentioned. (VALADARES, et al., 2008). Thus, a broader knowledge about the climacteric and its treatment, make them safer and reduces negative beliefs regarding menopause (VALADARES, et al., 2008)

Hormone therapy with estrogen alone or in combination with progesterone is the most effective treatment available to reduce climacteric symptoms, including hot flashes, vaginal dryness, urinary symptoms, and emotional lability. (Alves, 2015; Felix, 2009). However, not all women can use this therapy. Some conditions such as breast and endometrial cancer, severe liver disease, unclear genital bleeding, history of acute and recurrent thromboembolism, and porphyria are part of absolute contraindications to this type of treatment, in addition to conditions in which it should the benefit of

its use, such as the presence of uncontrolled hypertension or diabetes mellitus, endometriosis and uterine myomatosis, should be carefully evaluated. In addition to contraindications, the use of hormone therapy has side effects, and when estrogen is used, nausea, gastrointestinal disorders, breast tenderness, headache, fluid retention, edema and probable stimulation of leiomyomas and endometriosis can be caused in some patients. (MINISTRY OF HEALTH, 2008)

Thus, in view of the risks established to this therapy, the interest and demand for alternative therapies to hormone therapy has currently increased to improve the quality of life of women who experience climacteric symptoms. (BARRA; et al, 2014)

Among the non-hormonal drugs, already documented we have raloxifene, which is a selective modulator of estrogen receptors, which promotes the prevention of osteoporosis, reduction in the risk of cardiovascular diseases, and prevention against breast cancer and endometrial cancer; In addition to it, it has tibolone, which is highly specific, improving libido and sexual performance. There are also phytoestrogens, which are able to inhibit the proliferation of cells responsible for breast cancer, act in the prevention of heart disease and increase the mineral content of the bones preventing osteoporosis. (FREITAS, et al., 2016)

In addition to drug therapy, we also have treatment not based on drugs in which the practice of physical exercises that help strengthen the bones and muscles, in addition to helping in the proper functioning of the heart. It is also recommended the cessation of tobacco, and the reduction of intake of coffee, alcohol and fried foods, as well as increasing the consumption of foods rich in isoflavones that are substances present in soy and its derivatives mainly, called phytoestrogens because they have a structure similar to estrogen (FREITAS, et al., 2016)

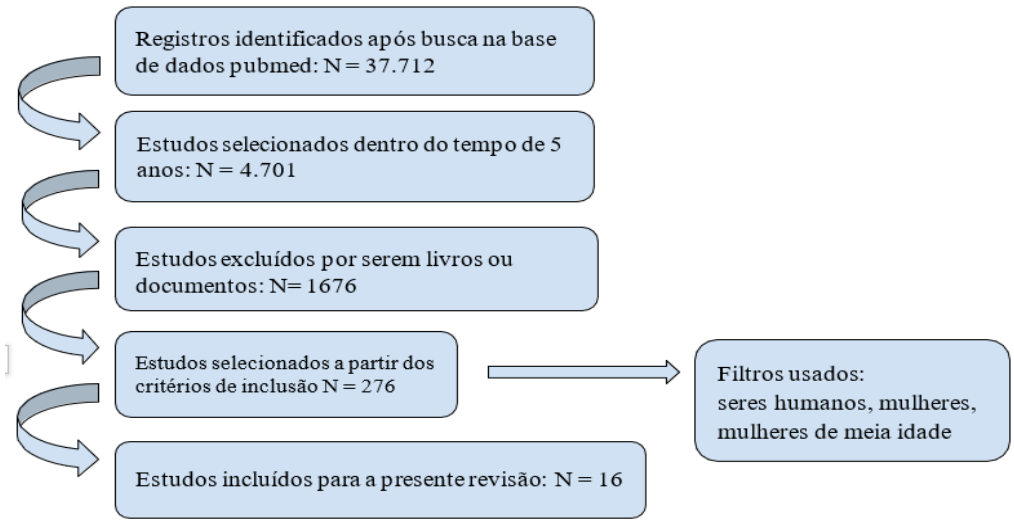
It is known that the use of therapies is related to high educational and socioeconomic levels. The fact is that there seems to be a lack of information about the benefits and risks of hormone therapy or other forms of treatment of climacteric syndrome, which generates doubts and insecurities to women. (VALADARES, et al., 2008). Thus, this study is important to enable a broader view of the non-hormonal treatments available.

2 METHODOLOGIES

This is a literature review study which consists of presenting new information by providing current knowledge on the topic explored or emphasizing gaps in the body of research and thus instigating researchers to improve the scientific database. For the construction of this study, the following steps were considered: selection of the theme and definition of the guiding question, search for a sample in the literature, establishment of inclusion and exclusion criteria, classification of data, analysis of selected contents, interpretation of collected data and synthesis and presentation of results. The precepts of Law No. 13 9.610/1998 were obeyed, topreserve and respect the ideas, concepts and

definitions of the authors of the analyzed productions, which will be presented reliably, described and cited. The data were presented through the descriptive approach, which allows the analysis, annotation and characterization of the data of a sample being divided into thematic categories, for the presentation of the results obtained.

For our work we used pubmed as a database. To select the texts, we used as keywords: climacteric, menopause, perimenopause, postmenopause, premenopause, hot flashes, therapy, drug therapy, complementary therapies, alternative therapy, alternative medicine, and excluded from the search the keywords estrogen replacement therapy and hormone replacement therapy, thus resulting in 37,712 articles found. Of these, we selected 4,701, which were published in the last 5 years. From this number, we exclude the books and documents, leaving 1676. With this, we filtered the work done in humans, women, middle-aged women (from 45 years old), resulting in 276 studies. From the reading of the texts, we selected 16 studies that dealt with studies on alternative therapy to hormone replacement for menopausal women. Exclusion criteria were: duplicate studies, not available, theses, dissertations, monographs, literature review, editorials and abstracts published in annals of events, presented outside the selected period, published in other languages and studies conducted outside Brazil. The articles that will be included are those that are available in full free of charge in Portuguese, English or Spanish.



3 FINDINGS

To facilitate the evaluation and analysis of the data, an instrument was developed that could provide the detailed information of the studies (Chart 1).

Article	Title	Authors	Goal	Method	Conclusion	Year
1	**Fezolinetant in the treatment of vasomotor symptoms associated with menopause.**	DEPYPERE, Herman; LADEMACHER, Christopher; SIDDIQUI, Emad; *et al*.	To identify the results of Fezolinetant in the treatment of vasomotor symptoms associated with menopause.	Descriptive review through dataset	Results to date have demonstrated a rapid and substantial reduction in the frequency and severity of VMS and associated improvements in health-related quality of life. NK3R antagonists offer a non-hormonal alternative to TH for the treatment of menopause-related VMS.	2021
2	**Neurokinin 3 Receptor Antagonists Compared with Serotonin Norepinephrine Reuptake Inhibitors for Non-Hormonal Treatment of Menopausal Hot Flushes:** A Systematic Qualitative Review.	MENOWN, Sara J.; TELLO, Javier A.	To evaluate whether NK3R antagonists (NK3Ras) are more effective than serotonin and noradrenaline reuptake inhibitors (SNRIs).	Systematic literature review	Administration of the NK3R antagonist resulted in a greater reduction from baseline in the frequency and severity of hot flashes in addition to night sweats compared with SNRIs.	2021
3	**Hormone Therapy for Postmenopausal Women**.	PINKERTON, JoAnn V.	Analyze the benefits and risks of menopausal hormone therapy, as well as revising the shapes Alternatives for the treatment of symptoms of menopause.	Review of Guidelines Formal followed by the Recommendations author's clinics.	After 3 to 5 years of hormone therapy, it must be an attempt to diminish and, occasionally stop treatment. If the symptoms persist, decrease doses or transdermal therapy may be offered, with periodic risk reassessment and Benefits.	2020
4	**Menopausal Hormone Therapy:** Comprehensive Review.	LUNGBERG, G.; WU, P.; WENGE, N.	Evaluate the relationship between the use of MHT and hypertension in ELSA-Brasil participants.	A study transverse using the baseline data of the ELSA-Brazil	The current use of MHT was not related to hypertension, especially in healthy women and in those under 60 years of age age	2020

5	**A phase 2b, Randomized placebo-controlled, double-blind, dose-ranging study of the neurokinin 3 receptor antagonist fezolinetant for vasomotor symptoms associated with menopause.**	FRASER Graeme L.; LEDERMAN, Samuel; SILVICULTURE M, Arthur; *and al.*	This phase 2b study had the following OBJECTIVE: To evaluate seven regimens of dosageof fefelinetant, a selective receptor antagonist of neurokinin 3, as a non-hormonal approach to VMS treatment	Mulheres at menopause with age >40-65 years with VMS moderate/severe (50 episodes/week) were randomizadas (double-blind) for fezolinetant 15, 30, 60, 90 mg BID ou 30, 60, 120 mg QD or placebo per 12 Weeks.	Fezolinetant is a non-therapy effective and well-tolerated hormonal that reduces quickly VMS menopausal grave.	2020
6	**European Menopause and Andropause Society (EMAS) and International Gynecologic Cancer Society (IGCS) position statement on managing the menopause after gynecological cancer: focus on menopausal symptoms and osteoporosis**	REES, Margaret; ANGIOLI, Roberto; COLEMAN Robert L.; *Et al.*	The goal is to establish a individualized approach to management, with or without therapy menopausal hormone, symptoms of menopause and prevention and treatment of osteoporosis in women with gynecological cancer.	Review of literature and consensus of opinion of Experts.	Caution is required with therapy systemic menopausal hormone and topical in women with tumors serous and granulosa cells due to their hormonal dependence, and The non-hormonal options are recommended as initial therapy. There is no evidence to contraindicate the use of menopausal hormone therapy systemic or topical by women with cervical, vaginal or vulvar cancer, for these tumors are not considered hormone-dependent.	2020
7	**Effect of the neurokinin 3 receptor antagonist fezolinetant on patient-reported outcomes in postmenopausal women with vasomotor symptoms:**	SANTORO N. et al.	Identify Antagonist Effect neurokinin receptor 3 fezolinetant in the results reported by the patient in postmenopausal women with vasomotor symptoms	In this study double-blind of 12 Weeks women in the post-menopause with VMS moderate/severe Were randomizadas for fezolinetant	Oral fezolinetant has been associated with response rates higher than placebo and greater improvements in quality of life and other measures of PRO, including a reduction in VMS-related interference at daily life.	2020

	Results of a randomized, placebo-controlled, double-blind, dose-ranging study (VESTA			15, 30, 60 or 90 mg BID ou 30, 60 or 120 mg QD or placebo.		
8	**Treatment of Menopausal Vasomotor Symptoms with Fezolinetant, a Neurokinin 3 Receptor Antagonist**: A Phase 2a Trial	DEPYPERE, H. et al.	To evaluate the safety and efficacy of NK3R antagonist fecalolinetant in menopause VMS	Twelve-week, double-blind, randomized, placebo-controlled study.	Fezolinetant rapidly and significantly reduced moderate/severe VMSs, supporting its potential as an effective non-hormonal treatment option for menopausal women.	2019
9	**Acupuncture or phy(F)itoestrogens vs. (E)strogen plus progestin on menopausal symptoms.**	PALMA, F; FONTANESI, F.; FACCHINET T, F.; CAGNACCI, A	Identify The effect of acupuncture and phytoestrogens on climacteric symptoms was compared to the effect of hormone therapy (HT) with estrogen plus progesterone	Randomized Study	Three months after the end of treatment, the benefits in MenQoL were conserved more after acupuncture than in TH ($p < .006$). Current data indicate that acupuncture, and to a lesser extent phytoestrogens, may be effective therapies for climacteric symptoms.	2019
10	**Menopause:** Hormones, Lifestyle, and Optimizing Aging	MINKIN, Mary Jane	Identify updates on the care of menopausal women, focusing on the symptoms and health problems that arise related to the decline of all reproductive hormones.	Study of descriptive approach	This article offers updates on the care of menopausal women, focusing on the symptoms and health problems that arise related to the decline of all reproductive hormones. Lifestyle adaptations and non-medical approaches and non-hormonal and hormonal medications are discussed.	2019
11	**Efficacy of a Homeopathic Medicine of Capsicum frutescens L. (Solanaceae) in the Treatment of Hot**	ANDRADE Deborah; CARMONA, Fabio; ANGELUCCI Matthew; *Et al.*	Test the hypothesis that in menopausal women, the homeopathic medicinal product of chili pepper pepper, compared to placebo, will reduce the intensity of heat waves,	Study Randomized double-blind, controlled by placebo clinical trial of phase 2 in	The homeopathic medicine of C. frutescens (Malagueta) was significantly higher than placebo in reducing the intensity of hot flashes in women in menopause after 4 weeks of treatment.	2019

	Flashes in Menopausal		after 4 weeks of treatment.	homeopathy clinic		
	Women: A Phase-2					
	Randomized Controlled Trial. Homeopathy					

12	. **Postmenopausal health interventions**: Time to move on from the Women's Health Initiative?	ZAW, J. J. T.; HOWE, P. R. C.; WONG R. H. X.	Identify Postmenopausal Health Interventions	Study of descriptive analysis, through referential.	Alternative therapies, such as phytoestrogens and non-hormonal prescriptions, may be beneficial for elderly women or unsuitable for HT. Direct long-term comparisons of HT with alternative interventions are warranted to confirm its effectiveness in preventing chronic disease	2018
13	**A Multi-center, Randomized, Controlled and Open Clinical Trial of HeyanKuntai Capsule) and Hormone Therapy in Perimenopausal Women**	SUN, A.; et al	To evaluate the efficacy and safety of HeyanKuntai Capsule (, HYKT) and hormone therapy (HT) in perimenopausal syndromes (PMS).	From 2005 to 2008, 390 women with PMS were recruited from 4 clinical centers.	HYKT can effectively relieve PMS and improve patients' quality of life without serious adverse reactions. Although HYKT exerted healing effects more slowly than the hormone, it has a better safety profile than the hormone	2018
14	**Menopause.** Primary Care:Clinics in Office Practice	POTTER, Beth; SCHRAGER, *et al.*	Identify, Signs and Symptoms in Menopause	Descriptive study, with referential analysis.	For women without a uterus, menopause should be based on the symptoms alone. For women under the age of 45 who are going through the menstrual cycle	2018
15	**Managing menopausal symptoms after cancer:** An evidence-based approach for primary care	MARINO, J. L.; MCNAMARA, H. C.; HICKEY, Mr.	Identify a Overview of current evidence for hormonal and non-hormonal treatments for vasomotor symptoms and vaginal dryness after cancer	Review, an approach to the management of Symptoms of menopause after cancer in all settings.	Primary care physicians should be aware of the problematic and ongoing nature of menopausal symptoms after cancer, should discuss them with all patients after cancer treatment, and should consider treatment or referral to a specialist for appropriate treatment.	2018

16	**Factors associated with complementary and alternative medicine use among women at midlife**	COSTANIAN, C.; CHRISTENSEN, R. A. G.; EDGELL, H.; *et al.*	Identify Factors Associated with the Use of Complementary and Alternative Medicine Among Midlife Women	A comprehensive bibliographic search conducted electronically, using Web	More studies are needed to confirm the characteristics of women who employ CAM to control their night sweats and hot flashes.	2017

4 DISCUSSIONS

After reading in full all the works that are included in this literature review, it was possible to evidence several established therapies that have been used for some time and also new therapies that are in studies evaluating efficacy and safety of the treatment.

One class of drugs already used in clinical practice are selective serotonin reuptake inhibitors (SSRIs). The North American Menopause Society recommends the use of escitalopram and paroxetine for the treatment of vasomotor symptoms of menopause. Paroxetine is currently the only non-hormonal treatment and the only SSRI at a dose of 7.5 mg/day that is FDA-approved for moderate to severe vasomotor symptoms; The use of all others is off-label. (LUNDBERG; WU; WENGER, 2020). It has been shown to decrease menopausal hot flashes by approximately 1 to 2 per day. Its side effects include dry mouth, headache, decreased appetite, nausea, constipation and insomnia. (POTTER; et al., 2018). Paroxetine (as well as fluoxetine) should not be used in patients using tamoxifen, as it may impair the conversion of tamoxifen to its active metabolite, and thus its action. (MARINO; et al., 2018).

Citalopram (10 and 20 mg per day) has been evaluated in patients with breast cancer and has shown benefit in reducing the frequency of flushing in these patients. (MARINO; et al, 2018). Effective doses of antidepressants for the relief of hot flashes are lower than those commonly used for treating depression, with onset of relief usually occurring within 2 to 3 weeks. (PINKERTON, 2020).

There is evidence of the efficacy of serotonin and norepinephrine reuptake inhibitors (SNRIs) for vasomotor symptoms of menopause. The mechanism is not clearly understood; However, serotonin and norepinephrine are known to be involved in the regulation of body temperature. (POTTER; et al, 2018). The North American Menopause Society recommends the use of desvenlafaxine and venlafaxine for the treatment of vasomotor symptoms of menopause. (POTTER; et al, 2018). Venlafaxine at a dose of 75 mg daily, which has been shown to reduce the frequency of hot flashes in breast cancer patients by up to 40%, and when compared with clonidine, requires less time for symptom reduction onset. (75 mg extended-release daily). (MARINO; et al., 2018).

Another non-hormonal (and off-label) option is gabapentin. Several well-designed randomized controlled trials (RCTs) have demonstrated the efficacy of gabapentin in reducing the frequency of hot flashes by approximately 2 per day. (POTTER; et al, 2018). Used lower doses than for neurological indications, it may be effective for relieving hot flashes. Given potential side effect of sedation, it is

usually prescribed before bedtime, starting in a small dose; A level of 300 mg is generally tolerated. (MINKIN, 2021). Doses of 900 mg/immediate-release dose (divided 3 times daily) and 1800 mg/dose of a long-acting formulation showed a greater benefit when compared to the former. (POTTER; et al, 2018). The mechanism of action of gabapentin in the treatment of vasomotor symptoms is not yet well understood. (POTTER; et al, 2018). Side effects include drowsiness, dizziness and headache, which may improve after the first few weeks of use. (POTTER; et al, 2018). Thus, this anticonvulsant has been shown to reduce menopausal symptoms, but has significant side effects. (ZAW; et. al, 2018)

Clonidine, an antihypertensive, has been shown to be effective in treating mild menopausal symptoms. (ZAW; et. al, 2018) It is an alpha-2-adrenergic agonist of central action, which has been shown to be more effective than placebo in decreasing vasomotor symptoms, although it is less effective when compared to estrogen, SSRIs/SNRIs, and gabapentin. (POTTER, et al., 2018). A 2006 meta-analysis showed a decrease in one heat wave per day with the use of clonidine compared to placebo. (POTTER, et al., 2018). Adverse effects include hypotension, headache, nausea, dizziness, sedation, and constipation. With abrupt cessation, rebound hypertension may occur. (POTTER, et al., 2018). Such a drug is little used in clinical practice due to the adverse effects that patients may present. (LUNDBERG; WU; WENGER, 2020)

As already mentioned, during climacteric urogenital complaints and/or urogenital atrophy are frequent, in this context, Ospemifene which is a selective modulator of the estrogen receptor (derived from toremifene) and intravaginal dehydroepiandrosterone (DHEA) are forms of non-hormonal treatment used to improve genitourinary symptoms. (ZAW; et. al, 2018) For problems related to vulvovaginal atrophy, a variety of bioadhesive lubricants and moisturizers are affordable.

Regarding moisturizers, the American Menopause Society recommends their use to relieve symptoms of vaginal dryness, but there is little evidence to support their effectiveness. (MARINO; et al, 2018).

Vaginal lubricants are substances applied to contact surfaces to reduce friction during sexual activity and thus pain, and common lubricating bases include water, mineral oils, vegetable oils, and polymerized siloxanes (i.e., silicone-based lubricants). (MARINO; et al, 2018). Laser therapy for vulvovaginal atrophy is a new approach, but larger, long-term studies are needed to explore its efficacy and safety before definitive conclusions can be drawn. (REES; et al, 2017).

Another approach studied is the Mona Lisa Touch (MLT), which is a non-hormonal therapy (fractionated carbon dioxide), in which laser is applied to the genital regial in order to restore tissues before menopause and provide relief from vulvovaginal symptoms. (ZAW; et. al, 2018)

Stellate ganglion block is a recent and minimally invasive approach, performing an injection of a local anesthetic into sympathetic nerve fibers in the neck in order to control temperature regulation. This treatment has been shown to reduce 45-90% of the symptoms of hot flashes and cold sweat,

having this effect a duration of 6 weeks to several months after the blockage. (ZAW; et. al, 2018). However, the use of this treatment is still controversial because stellate ganglion blockade is an invasive and costly approach, and there is not yet sufficient evidence to prove its efficacy in the treatment of vasomotor symptoms. (MARINO; et al., 2018)

Studies are being conducted with the use of Resveratrol for Healthy Aging in Postmenopausal Women. RESHAW is a 2-year, double-blind, randomized, placebo-controlled crossover study conducted with 140 postmenopausal women aged 45 to 85 years, at least 12 months postmenopausal, nonsmokers, and non-users of HT. (ZAW; et. al, 2018). Research evaluates the effects of 75 mg of the drug twice daily on cognition (main outcome), cerebrovascular function, mood and other aspects of well-being, cardiometabolic and bone health, and function

In addition to these, it also seems to influence cardiovascular function and cognition. The study had not yet been finalized, but the expected benefits of long-term resveratrol supplementation include counteracting accelerated cognitive, cerebrovascular and physical decline and improving overall well-being, cardiometabolic health and bone mineral density in postmenopausal women. (ZAW; et. al, 2018)

When it comes to non-pharmacological therapies, studies have proved controversial. While Costanian and Pinkerton say acupuncture, exercise, naturopathy, yoga, tai chi and self-help approaches that include relaxation and stress management are not recommended for relief of vasomotor symptoms as they have shown inconsistent or negative results. However, they are shown to be effective in reducing stress. (COSTANIAN; et al, 2017), (PINKERTON, 2020). Lundberg and Wenger say some lifestyle changes have been shown to decrease menopausal symptoms, such as weight loss and control, exercise, dietary changes such as avoiding spicy foods, and avoiding alcohol intake and nicotine. (LUNDBERG; WU; WENGER, 2020).

Other therapies aimed at reducing stress such as hypnosis, mindfulness and cognitive therapies are being studied to treat menopausal symptoms, but data are still limited (LUNDBERG; WU; WENGER, 2020). Hypnosis techniques appear to be promising, so a study of breast cancer patients showed good results regarding relief of vasomotor symptoms, mood and sleep. (MARINO, et al., 2018).

The HeyanKuntai capsule is a non-hormonal treatment alternative for women who have contraindications or who do not feel safe to make use of hormonal therapies to control climacteric symptoms. (SUN, et. al., 2018) Its effect is to regulate the level of estrogen slowly, modulating the ovary in order to induce follicular development. (SUN, et. al., 2018) In addition, this treatment can stimulate luteinization, increase the wet weight of the uterus, increase serum estrogen and promote the maturation of vaginal cells. (SUN, et. al., 2018). Its effect is compared to estradiol valerate, so its effect

may be related to the ovarian condition, and may help in the transition period of menopause. (SUN, et. al., 2018).

A randomized controlled trial was conducted in four clinical centers in Beijing and Shanghai over a period of 1 year, conducted with 318 women (who continued in the study until its completion) in menopause, in which it was seen that the HeyanKuntai capsule showed good results as an alternative therapy to hormone replacement therapy, to treat climacteric symptoms. (SUN, et. al., 2018) It has been seen to be helpful in relieving symptoms such as sleep disturbances, anxiety and depression, and in sexual quality of life, as well as less common symptoms such as paresthesia, dizziness, fatigue, muscle and joint pain and headaches in perimenopausal women. (SUN, et. al., 2018). When it was compared to Hormone Therapy (HT), it was seen that the capsule is as effective as, in the long term, presenting even fewer adverse symptoms, but requires higher doses than in HT, for its effects to be achieved. (SUN, et. al., 2018).

A study was conducted using chili pepper to treat climacteric symptoms. A phase 2, randomized, placebo-controlled, double-blind clinical trial was designed to test the hypothesis that in menopausal women, the homeopathic drug Malaguette (30 CH), compared to placebo, will significantly reduce the intensity of hot flashes. (ANDRADE, et. al., 2019). The primary outcome was the intensity of hot flashes, measured by the Measure Yourself Medical Outcome Profile (MYMOP) instrument. (ANDRADE, et. al., 2019). A total of 40 women were included in the study, 20 in each group. It was shown in this study that in menopausal women, the homeopathic medicine of chili pepper, compared to placebo, significantly reduced the intensity of hot flashes after 4 weeks of treatment. (ANDRADE, et. al., 2019). Malagueta was also shown to improve secondary symptoms, activity level and well-being. (ANDRADE, et. al., 2019). The authors say the results are important because Malagueta is the first homeopathic medicine to be effective for hot flashes in a clinical trial. In addition, it is an inexpensive source and available worldwide, making it an excellent alternative for women seeking relief from hot flashes. (ANDRADE, et. al., 2019).

Non-prescribed therapies that were no more effective than placebo in high-quality randomized trials of vasomotor symptoms include the use of: black cohosh (which is associated with liver toxicity), dongquai, evening primrose oil, flaxseed, apple, n-3 fatty acids, ginseng, red clover, vitamin E, and medicinal herbs. (COSTANIAN; et al, 2017), (PINKERTON, 2020).

A new non-hormonal oral therapy called fezolinetant is in clinical development for the treatment of the vasomotor symptoms of moderate to severe menopause. (SANTORO, et al., 2020).

A subset of hypothalamic neurons that co-expresses the neuropeptides kisspeptin, neurokinin B (NKB), and dynorphin (KNDy neurons) project from the nucleus arc to the preoptic area of the hypothalamus and are believed to play a key role in thermoregulation. (GRAEME; et al, 2020). These

KNDy neurons are inhibited by estrogen and stimulated by NKB. (SANTORO, et al., 2020). During menopause, estrogen levels decrease, leading to increased NKB signaling. (SANTORO, et al., 2020).

The altered activity of this neural circuit results in the thermoregulatory center becoming hypersensitive to external signals from peripheral receptors, activating the dissipation of heat effects (e.g., sweating, vasodilation), and is believed to be the physiological basis of why many menopausal women experience vasomotor symptoms. (GRAEME; et al, 2020).

Fezalinether is a neurokinin 3 receptor antagonist (NK3R) that blocks neurokinin B signaling (SANTORO, et al., 2020). The drug selectively and reversibly blocks NKB signaling, decreasing the pulse rate of GnRH consistent with a decrease in KNDy neuron activity, leading to a decrease in vasomotor symptoms. (DEPYPERE, et al., 2019).

This therapy has been shown to be beneficial in reducing vasomotor symptoms. (SANTORO, et al., 2020). In a study of 287 menopausal women, it was found that it was superior to placebo to decrease vasomotor symptoms and also showed the mean time to reduction of 50% of the frequency of vasomotor symptoms of moderate/severe ranged from 8.4 days for fezolinetant 15 mg BID to 2.2 days for fezolinetant 90 mg BID. At higher doses, better results were seen in symptom control. (SANTORO, et al., 2020)

In the first pilot/phase 2a clinical trial of an NK3 Antagonist conducted in accordance with the US Food and Drug Administration Guidelines (FDA) for the clinical evaluation of treatments for VMSs demonstrated that fezolinetant significantly reduced the frequency of moderate/severe VMSs and moderate/severe VMS score, with its beneficial effects achieved as early as the first day of treatment and sustained throughout the study. (DEPYPERE, et al., 2019). Fezolinetant also improved sleep quality and other patient-reported outcomes, which measure the impact of VMSs on quality of life. (DEPYPERE, et al., 2019). In comparison, paroxetine reduced VMS frequency by 6.2 to 9.2 episodes per week at week 12 compared to placebo. (DEPYPERE, et al., 2019) In another randomized, double-blind, placebo-controlled study also in phase 2b, conducted at 51 sites in the United States in the period from July 19, 2017 to September 19, 2018, with a total of 356 participants who received either the medication or placebo showed that such a drug reduced vasomotor symptoms of moderate/severe intensity by about 62% to 81% at week 4 of the study, depending on the dose, compared to about 39% reduction with placebo; at week 12, moderate/severe MVR was reduced by about 74% to 87% with ferolitant versus 55% with placebo, and it was well tolerated by participants. (GRAEME; et al, 2020).

Again, in a new study conducted in 2021, fezolinetant significantly reduced the frequency of hot flashes (OC) when compared to placebo. The frequency of reduction in the fezolinetant group was from an average of 80.7 weekly episodes at baseline to 5.7 at week 12. (DEPYPERE; et. al, 2021). In the placebo group, the reduction in frequency was 46%, from an average of 72.0 weekly episodes at

baseline to 39.0 at week 12. Severity and frequency of moderate/severe VMS were reduced from the first day of treatment. Treatment with ferolinetant resulted in improvement from baseline in sleep quality, overall daily interference, symptoms, and function at weeks 4, 8, and 12. (DEPYPERE; et al, 2021).

Fraser also reports the results of a randomized, double-blind, placebo-controlled, dose-varied, parallel group study conducted at 51 U.S. sites of a different compound in the same class of NK3R—fezolinetant antagonists (Astellas Pharma Inc, Northbrook, IL; formerly ESN364, Ogeda SA) for the treatment of VMS in postmenopausal women. Fraser's study in this issue adds to the growing evidence that pharmacological blockade of NKB signaling with an NK3R antagonist can markedly improve symptoms of "vasomotor instability" regardless of any effect, suggesting great promise for such agents as a novel therapy. This new direction in hot flash research may represent just the tip of the iceberg that foreshadows the development of a number of non-hormonal compounds with potential broad clinical implications for women's health in middle age.

Finally, when the use of ferolinetant was compared with SNRI, administration of the NK3R antagonist resulted in a greater reduction from baseline in the frequency and severity of hot flashes, as well as night sweats compared with SNRIs. (MENOWN, Sara J.; TELLO, Javier A., 2021). The authors showed a reduction in the frequency of vasomotor symptoms that was statistically significant (from 48 to 67% at weeks 8 or 12), while all NK3R antagonist trials showed a statistically significant reduction in HF frequency (from 62 to 93% from baseline at weeks 2, 4, or 12). (MENOWN, Sara J.; TELLO, Javier A., 2021). While the SNRI studies reported low tolerability, particularly nausea, the fezolinetant studies reported good overall tolerability, although they reported elevation in transaminases. (MENOWN, Sara J.; TELLO, Javier A., 2021).

5 FINAL CONSIDERATIONS

Based on the study, it was possible to identify several forms of alternative therapies for the relief of climacteric-related symptoms, although some of them still need more studies to prove their efficacy and safety.

REFERENCES

ALVES, E. R. A.; et al. Climatério: a Intensidade dos sintomas e o desempenho sexual. Texto & Contexto - Enfermagem, v. 24, n. 1, p. 64–71, 2015.

AMORIN, E. Climatério, menopausa: desafios na vida pessoal e Profissional da mulher. Revista Acadêmica Oswaldo Cruz, v. 8, n.31, 2020.

ANDRADE, Débora; CARMONA, Fabio; ANGELUCCI, Mateus; et al. Efficacy of a Homeopathic Medicine of Capsicum frutescens L. (Solanaceae) in the Treatment of Hot Flashes in Menopausal Women: A Phase-2 Randomized Controlled Trial. Homeopathy, v. 108, n. 02, p. 102–107, 2019.

BARRA, A. A. et al. Terapias alternativas no climatério. Revista Feminina, v. 42, n. 1, p. 27–31, 2014.

BRASIL, MINISTÉRIO DA SAÚDE. Manual de Atenção à Mulher no Climatério / Menopausa. v.1, n. 9 p. 136-137, 2008. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/manual_atencao_mulher_climaterio.pdf. Acesso em: 15/12/21.

BRASIL. MINISTÉRIO DA SAÚDE. Protocolos da Atenção Básica: Saúde das Mulheres. v.1 Brasília, 2016.

COSTANIAN, C.; CHRISTENSEN, R. A. G.; EDGELL, H.; et al. Factors associated with complementary and alternative medicine use among women at midlife. Climacteric, v. 20, n. 5, p. 421–426, 2017.

DEPYPERE, H. et al. Treatment of Menopausal Vasomotor Symptoms with Fezolinetant, a Neurokinin 3 Receptor Antagonist: A Phase 2a Trial. Journal of Clinical Endocrinology and Metabolism, v. 104, n. 12, p. 5893–5905, 2019.

DEPYPERE, Herman; LADEMACHER, Christopher; SIDDIQUI, Emad; et al. Fezolinetant in the treatment of vasomotor symptoms associated with menopause. Expert Opinion on Investigational Drugs, v. 30, n. 7, p. 681–694, 2021.
FEBRASGO. Manual de Orientação do Climatério. p. 9-16, 2010. Disponível em: https://docs.bvsalud.org/biblioref/2020/03/1052419/manual_climaterio-2010.pdf. Acesso em: 15/12/21.

FÉLIX, L. M. C.; LIMA, S. M. R. R.; CAMPANER, A. B. Terapêutica não hormonal no tratamento de distúrbios do climatério. Femina, p. 2–5, 2009.

FRASER, Graeme L.; LEDERMAN, Samuel; WALDBAUM, Arthur; et al. A phase 2b, randomized, placebo-controlled, double-blind, dose-ranging study of the neurokinin 3 receptor antagonist fezolinetant for vasomotor symptoms associated with menopause. Menopause, v. 27, n. 4, p. 382– 392, 2020.

FREITAS, K. S.; NASCIMENTO, R. Atenção Farmacêutica no climatério e menopausa. Revista Saberes da FAPAN, v. 3, n. 1, p. 04–12, 2016.

LUNGBERG, G.; WU, P.; WENGE, N. Menopausal Hormone Therapy: a Comprehensive Review. Current Atherosclerosis Reports. v22, n8, p 1-9, 2020.

MARINO, J. L.; MCNAMARA, H. C.; HICKEY, M. Managing menopausal symptoms after cancer: An evidence-based approach for primary care. Medical Journal of Australia, v. 208, n. 3, p. 127–132, 2018.

MINKIN, Mary Jane. Menopause: Hormones, Lifestyle, and Optimizing Aging. Obstetrics and Gynecology Clinics of North America, v. 46, n. 3, p. 501–514, 2019.

PALMA, F; FONTANESI, F.; FACCHINETT, F.; CAGNACCI, A. Acupuncture or phy(F)itoestrogens vs. (E)strogen plus progestin on menopausal symptoms. A randomized study. Gynecological Endocrinology, v. 35, n. 11, p. 995–998, 2019.

PINKERTON, JoAnn V. Hormone Therapy for Postmenopausal Women. New England Journal of Medicine, v. 382, n. 5, p. 446–455, 2020.

POTTER, Beth; SCHRAGER, Sarina; DALBY, Jessica; et al. Menopause. Primary Care: Clinics in Office Practice, v. 45, n. 4, p. 625–641, 2018.

REES, Margaret; ANGIOLI, Roberto; COLEMAN, Robert L.; et al. European Menopause and Andropause Society (EMAS) and International Gynecologic Cancer Society (IGCS) position statement on managing the menopause after gynecological cancer: focus on menopausal symptoms and osteoporosis. Maturitas, v. 134, p. 56–61, 2020.

SANTORO, N. et al. Effect of the neurokinin 3 receptor antagonist fezolinetant on patient- reported outcomes in postmenopausal women with vasomotor symptoms: Results of a randomized, placebo-controlled, double-blind, dose-ranging study (VESTA). Menopause, v. 27, n. 12, p. 1350– 1356, 2020.

SUN, A.; et al. A Multi-center, Randomized, Controlled and Open Clinical Trial of Heyan Kuntai Capsule (和颜坤泰胶囊) and Hormone Therapy in Perimenopausal Women. Chinese Journal of Integrative Medicine, v. 24, n. 7, p. 487–493, 2018.

ZAW, J. J. T.; HOWE, P. R. C.; WONG, R. H. X. Postmenopausal health interventions: Time to move on from the Women's Health Initiative?. Ageing Research Reviews, v. 48, n.?, p.79–86, 2018.

Inhibition of methylation and notch receptors in cutaneous melanoma

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ABSTRACT
Cutaneous melanoma is skin cancer that originates from melanocytes or their precursors, melanoblasts and stem cells, being a cancer with high mortality. It is considered the most serious type of skin cancer because of its ability to spread quickly to other parts of the body (Shain 2016). Excessive exposure to ultraviolet radiation from the sun (a factor modifiable by human action) is its main external cause, with heredity predominating as the main cause in about 8 to 10% of cases. This includes prolonged exposure to the sun without adequate protection as well as the use of artificial tanning beds, which emit radiation similar to that of the sun.

Keywords: Methylation, Cutaneous melanoma, Cancer.

1 INTRODUCTION

Cutaneous melanoma is skin cancer that originates from melanocytes or their precursors, melanoblasts and stem cells, being a cancer with high mortality. It is considered the most serious type of skin cancer because of its ability to spread quickly to other parts of the body (Shain 2016). Excessive exposure to ultraviolet radiation from the sun (a factor modifiable by human action) is its main external cause, with heredity predominating as the main cause in about 8 to 10% of cases. This includes prolonged exposure to the sun without adequate protection as well as the use of artificial tanning beds, which emit radiation similar to that of the sun.

Immunotherapy and targeted therapy have shown remarkable results in the treatment of advanced cutaneous melanoma. Some patients experience a lasting response to immunotherapy, with tumors significantly decreasing in size or even disappearing completely. Three classes of immunotherapies are available for clinical use: inhibitors of CTLA4 receptors (cytotoxic T-lymphocyte-associated protein 4), inhibitors of PD1 receptors (programmed cell death protein 1) or PDL1 protein, and inhibitors of LAG3. These receptors are present on T lymphocytes (Qin 2023).

Targeted therapy is another important approach in the treatment of advanced cutaneous melanoma. It inhibits specific molecules or signaling pathways that are involved in the growth and proliferation of melanoma cells. They can be used when the melanoma has mutations in the BRAF gene. About 80% of these mutations are BRAFV600E, and BRAFV600k from 5 to 30%. There are two main types of targeted therapy in cutaneous melanoma and they are most often used together: BRAF inhibitors (vemurafenib, dabrafenib, and encorafenib) and MEK inhibitors (trametinib, cobimetinib, and binimetinib). Unfortunately, most patients initially respond well and then fail to respond due to the development of resistance mechanisms. The association of immunotherapies with targeted therapy is widely used in an attempt to overcome resistance (Lopes 2022). However, the response to immunotherapy and targeted therapy varies from person to person, and not all patients are successful. About 60% of these patients develop resistance and their disease progresses. It is necessary to find new forms of treatment.

In the human genome there are approximately 23,000 genes and they encode approximately 100,000 proteins. These proteins can be altered by post-translational (epigenetic) modifications, such as sumoylation, phosphorylation, acetylation, ubiquitination and methylation of DNA and histones, proteins that form the structure around which DNA is wrapped. Epigenetic changes are divided into four levels of regulation of gene expression: DNA methylation, histone modification, chromatin remodeling and regulation of non-coding RNAs; the deregulation of lysine methyltransferase enzymes are associated with tumor initiation, invasion and development of metastases, changes in the immune microenvironment and drug resistance. These modifications regulate the ability of transcription factors to access underlying DNA and which impact transcription, replication, and chromatin stability (Bates 2021, Harel 2021, Moran 2021).

Histone methyltransferases have been the subject of intensive study in drug development. Understanding how these enzymes regulate chromatin structure and gene expression has led to the development of targeted therapies known as histone methyltransferase inhibitors. These inhibitors aim to modulate the activities of these enzymes, potentially altering gene expression patterns in diseases such as cancer.

- The two most important classes of methyltransferases are DNA methyltransferases and protein methyltransferases. The former are enzymes that add methyl groups to the nitrogenous bases of DNA. This has a significant impact on the regulation of gene expression, as DNA methylation can silence gene activity. This is because hypermethylation of gene promoter regions can lead to inhibition of gene transcription and is associated with pathological processes, including cancer. Protein methyltransferases are enzymes that add methyl groups to amino acid residues in proteins. A well-known example is the methylation of lysine and arginine to histones, proteins that help organize DNA into

chromatin. The most extensively studied histone methylation sites include histone 3 on lysine 4 (H4K4), histone 3 on lysine 9 (H3K9), histone 3 on lysine 27 (H3K27), and histone 4 on lysine 20 (H4K20) (Martin 2005, Nacev 2019). Methylation of lysine residues on histones H3 and H4 can have varying effects, depending on the specific site of methylation. For example, lysine 4 methylation of histone H3 (H3K4) is generally associated with more open and active chromatin regions where gene expression is allowed. On the other hand, lysine 9 methylation of histone H3 (H3K9) is associated with more compact chromatin regions and gene silencing. Histone lysine cleavages are associated with different chromatin states with specific implications for gene regulation:

- • H3K4 (Histone H3 lysine 4): Histone H3 lysine 4 methylation is often associated with more accessible and active regions of chromatin where gene transcription is more likely to occur. This methylation is generally seen as a marker of active promoter and enhancer regions of genes.
- H3K9 (Histone H3 lysine 9): Histone H3 lysine 9 methylation is typically associated with tight chromatin regions and gene silencing. This is because H3K9 methylation recruits proteins that promote the formation of heterochromatin, a densely packed form of chromatin that tends to silence transcription. H3K9 is initially methylated by G9a dimers (EHMT2 gene) and GLP (EHMT1 gene) to form activator H3K9 monomethylation which is further methylated by G9a to form repressive H3K9 dimethylation (H3K9me2). G9a directly contributes to dimethylation and subsequent trimethylation in H3K9 throughout the genome.H3K27 (lisina 27 da histona H3): a metilação da lisina 27 da histona H3 também está associada ao silenciamento gênico. É frequentemente encontrado em regiões de cromatina que regulam o desenvolvimento celular e a diferenciação.

Dysfunctions in methyltransferase activities can be associated with a variety of diseases, including cancer, genetic disorders and neurodegenerative diseases. Therefore, the study of methyltransferases and methyl modifications plays an important role in scientific research and medicine, in addition to understanding how these enzymes regulate cellular processes, it can lead to the development of new targeted therapies, including epigenetic treatments for cancer and other diseases. related to gene regulation. Histone methyltransferases (HMTases) are a group of enzymes that catalyze the addition of methyl groups (-CH3) to specific amino acid residues on histones, which are fundamental proteins in the structure of chromatin.

Histone lysine methyltransferases (KMTs), also known as histone lysine methyltransferases (HKMTs), are a group of enzymes that catalyze the addition of methyl groups (-CH3) to lysine residues on histones, which are the proteins that help organize the DNA in chromatin. Histone methylation is a fundamental epigenetic modification that plays an important role in the regulation of gene expression

and formation of chromatin structure. Dysregulation of histone lysine methyltransferase is associated with tumor initiation, invasion and metastasis, resistance to drugs and the immune microenvironment (Liao 2023).

KMTs work by transferring a methyl group from a methyl donor (usually the coenzyme S-adenosylmethionine, or simply SAM) to lysine residues present on histones. SAM is formed from methionine and ATP, a process that produces phosphate and pyrophosphate. After transfer of the methyl group, SAM is converted to S-adenonsilhomocysteine. This modification can occur at different positions of lysine and have varying effects on the regulation of gene expression and cell activity. Simultaneous binding of SAM to the post-SET flexible domain stimulates folding of the domain and directs the binding of the remaining peptide residues. This domain can close to complete the substrate binding site and allow catalysis to take place.

Since KMTs have shown promise in research, many studies are exploring the use of histone methyltransferase inhibitor KMTs as potential cancer treatments. That's because KMT inhibitors can be combined with other therapies such as chemotherapy, immunotherapy and targeted therapy to increase the effectiveness of treating many types of cancer. Precisely because epigenetic modifications play an important role in regulating gene expression in cancer cells, researchers are evaluating how specifically inhibiting KMTs can affect tumor growth, cell proliferation, and sensitivity to other treatments.

An example of this are the lysine histone methyltransferase (KMTs) inhibitors, which are a class of compounds that target the KMT enzymes, which catalyze the methylation of lysine residues in histones. These inhibitors were developed with the aim of modulating the activity of KMTs and, consequently, the epigenetic modifications in histones. This may have implications for the regulation of gene expression and associated cellular processes, including development, cell differentiation and disease.

Biochemical studies show that G9a and GLP have the same substrate specificity on histones. And recent publications have identified G9a as a functional oncogene in melanoma, either through recurrent activating mutations in the SET domain or through amplification of the genomic locus. Depending on the position of the modified residue, histone methylation can either suppress (H3K9, H3K27) or elevate (H3K4) gene expression. Together, histone modifications and DNA methylation tightly regulate chromatin accessibility within cells (Flesher 2021, Haeb 2021, Fath 2022).

During hypoxia, G9a activity increases, leading to an increase in global histone H3K9 methylation. As hypoxia is considered an important factor in the development of metastases, the acquisition of cell motility under hypoxic conditions has been correlated with a reduction in the expression of cell adhesion molecules. How G9a inhibits the expression of cell adhesion factors such as E-cadherin and epithelial cell adhesion molecules. The correlation between G9a-mediated

repression of cell adhesion molecules and increases in their activity during hypoxia strongly supports the direct involvement of G9a in the metastatic pathway.

G9a is a lysine methyl transferase enzyme responsible for the monodimethylation and dimethylation of histone H3 lysine 9 (H3K9), a reversible modification usually associated with the silencing of transcriptional genes. G9a overexpression is associated with a poor prognosis in different types of cancer, including melanoma, by upregulating the Nocth1 signaling pathway, silencing tumor suppressors, or activating epithelial-mesenchymal transition programs) (Casciello 2015, Fan 2015, Dang 2021 , Son 2021, Liao 2023).

Among the various preclinical studies, we highlight one where the G9a inhibitor UNC0638 combined with cisplatin for head and neck squamous cell carcinoma showed the ability to reduce resistance to cisplatin (Liu 2017) and another study, still in progress, associates EZH2 inhibitor (tazemetostat) with BRAF and MEK inhibitors for treatment of advanced melanoma (NCT05152459) (Liao 2023).

G9a inhibitors can inhibit tumor growth by blocking cell cycle progression and triggering apoptosis or inducing autophagic cell death (Cao 2019, Liao 2023). Furthermore, G9a plays a significant role in heterochromatin formation, DNA methylation, transcriptional silencing, proliferation, apoptosis, differentiation and mobility of tumor cells (Kato 2020).

A clinical trial funded by the European Union focused on the development of molecular inhibitors of the enzyme histone lysine methyltransferases (HKMT) as potential therapeutic agents for the treatment of cancer. The researchers used a class of derivatives of the 2,4-diaminoquinazoline molecule, which are known to act as competitive inhibitors of methyltransferases. After synthesizing a library of 2,4-diaminoquinazolines and evaluating the compounds through enzymatic assays and cell-based assays, different inhibitors were identified with IC50 values (50% of the maximum inhibitory concentration) of up to 1 μM. In cell-based assays, inhibitors increased mRNA levels of genes known to be silenced by activation of HKMTs. One of the inhibitors showed activity in an experimental mouse model with MDA-MB-231 xenografts (breast cancer). In 2020, the FDA approved the first KMT inhibitor, tazemetostat for the treatment of epithelioid sarcoma and follicular lymphoma (Hoy 2020, Liao 2023).

Currently, three compounds have been widely used as G9a inhibitors, BIX01294 and UNC0638 being used in vitro, and UNC0642 tested in preclinical models in vivo, due to their more favorable pharmacokinetics, better half-life, while maintaining high selectivity and low cellular toxicity; both G9a and GLP contain ankyrin repeats to recognize these methylation residues and a SET domain that is required for catalytic activity that utilizes SAM, the methyl radical donor (Flesher 2021). UNC0642 was discovered to be a potent inhibitor of G9a and GLP, with low toxicity and high selectivity, making it suitable for animal studies (Liu 2013). In this sense, the compound UNC0642 acts as a competitive

inhibitor of G9a activity, binding to its binding site and making it inaccessible. Several small molecule inhibitors have been developed with the ability to inhibit the catalytic activity of G9a and have been used in various in vitro and in vivo experiments (Park 2022). A study combining a G9a inhibitor (UNC0642 with an immunotherapy (anti-PD1) showed an increase in the effectiveness of immunotherapy, with greater survival and a lower incidence of acquired resistance to blocking the checkpoint inhibitor in murine melanoma (Kelly 2021). Studies have shown that inhibitors of G9a inhibit tumor growth by blocking cell cycle progression, triggering apoptosis, or inducing autophagic cell death (Liao 2023).

In 1914, Dexter described the Notch gene as being responsible for the notch phenotype on the wing margins of Drosophila melanogaster, and in the 1970s Spyros cloned and sequenced the Locus notch. Notch receptors are heterodimeric cell membrane proteins that have 5 Nocth ligands (DLL1, 2 and 3 and Jagged 1, 2), 4 of which have been identified in humans and rodents (Notch 1, 2, 3 and Notch 4).

Notch is known as a conserved signaling pathway in multicellular animals and is involved and acts in the regulation of cell cycle and proliferation, cell differentiation and fate, stem cell maintenance, survival, response to hypoxia, maintenance of homeostasis of adult tissue and apoptosis and in epitheliomesenchymal transitions (Oliveira Filho 2020).

It is known that positive signaling of the Notch1 pathway specifically contributes to the development of melanoma, allowing these cells to survive and proliferate in stressful, hypoxic environments (Ayaz 2014, Bedogni 2014, Tang 2019, Zhang 2016). This is because elevated Notch has been associated with antitumor immunity (Yang 2019), resistance to MEK inhibitors (Porcelli 2021), and MITF repression, leading to an invasive phenotype. Notch is involved in the progression of cutaneous melanoma, and that, from the interaction of melanoma cells with keratinocytes of the epidermis, there would be an activation of the Notch pathway, providing a phenotype capable of melanoma cells invading the basal membrane, passing to the vertical growth phase (Golan 2019). G9a stimulates the entire process of carcinogenesis through activation of notch1.

Research is focused on developing selective and specific KMT inhibitors. This is critical to minimizing unwanted side effects and maximizing therapeutic benefits. In addition to therapeutic applications, researchers are also investigating the molecular mechanisms by which KMT inhibitors affect chromatin structure, gene regulation, and cellular processes. This may lead to a deeper understanding of epigenetic regulatory systems, including the action of these drugs on other tissues and organs, understanding side effects.

KMT inhibitors can be classified into two main types: selective and broad-spectrum inhibitors. The former are designed to target a specific KMT enzyme or a subset of related KMTs that have similar targets. This allows for a more precise approach, targeting specific epigenetic modifications at specific

histone sites. Examples of selective inhibitors include those that target KMTs that act on H3K9 or H3K27 methylations. Broad-spectrum inhibitors: target multiple KMTs less specifically. They affect a broader spectrum of epigenetic modifications and may have more widespread effects on cells. This can be beneficial for manipulating gene expression generally, but it can also result in side effects. Importantly, as with any pharmacological development, safety, efficacy, and specificity are crucial considerations when developing KMT inhibitors for clinical applications.

2 CONCLUSIONS

Experimental studies with lysine histone methyltransferase (KMTs) inhibitors are ongoing in several fields of scientific research, including molecular biology, epigenetics, oncology and drug development. These studies aim to better understand the function of KMTs, investigate their roles in normal and pathological cellular processes, and evaluate the therapeutic potential of KMT inhibitors in various diseases. Clinical trials of lysine methyl transferase inhibitors in the treatment of advanced cutaneous melanoma are still in the early stages. They are being tested alone and in combination with immunotherapeutics (anti-CTLA4, anti-PD1) and targeted therapy agents (BRAF/MEK inhibitors). It is believed that these drugs can reverse resistance to immunotherapies and targeted therapy agents, making treatment more effective. It is also expected that they may affect genes involved in the metastasis of cutaneous melanoma, reducing the ability of melanoma to affect other organs in the body.

These studies on KMTs and their inhibitors are crucial for understanding the epigenetic mechanisms underlying diseases and biological processes, aiming to modulate the activity of these enzymes for targeted treatments of diseases related to epigenetic dysfunctions, such as cancer and genetic disorders. This places these experimental researches as a fundamental focus for the advancement of knowledge towards the clinical application of these compounds.

There are many challenges associated with the clinical use of KMTs inhibitors: specificity - these inhibitors must be selective for target KMTs and not negatively affect other biological pathways; side effects – as KMTs are involved in many physiological cellular processes, the possibility of side effects is great and should be studied and monitored; tumor heterogeneity – the heterogeneity of tumor cells makes it difficult to predict which patients will respond to KMT inhibitors; resistance – as with immunotherapy and targeted therapy treatments, tumor cells can develop resistance to KMT inhibitors over the course of their use. The development of new drugs is a long and complex process. Integration and cooperation among researchers is essential to speed up the discovery of new treatments for advanced cutaneous melanoma.

REFERÊNCIAS

Ayaz F, Osborne BA. Non-canonical Notch signaling in cancer and immunity. *Front Oncol*.2014;4:345. https://doi.org/10.3389/fonc.2014.00345.

Bates S. Epigenetic Therapies for Cancer. *N Engl J Med*. 2021; 383:650-63. https://doi.org/10.1056/NEJMra1805035.

Casciello F, Windloch K, Gannon F, Lee JS. Functional Role of G9a Histone Methyltransferase in Cancer. *Front Immunol*. 2015;25:487. https://doi.org/10.3389/fimmu.2015.00487. eCollection 2015.

Bedogni B. Notch signaling in melanoma: interacting pathways and stromal influences that enhance notch targeting. *Pigment Cell Melanoma Res*. 2014; 27:162-8. https://doi.org/10.1111/pcmr.12194.

Cao H., Ku K., Yang D., et al. Recent progress in histone methyltranferase (G9a) inhibitors as anticâncer agentes. *Eur. J. Med. Chem*. 2019; 179:537-46.

Dang N, Jiao J, Meng X, An Y, Han C, Huang S. Abnormal overexpression of G9a in melanoma cells promotes cancer progression via upregulation of the Notch1 signaling pathway. *Aging (Albany NY)*. 2021];12: 2393- 407. https://doi.org/10.18632/aging.102750.

Fan J, Xing Y, Wen X, et t. Long non-coding RNA ROR decoys gene-specific histone methylation to promote tumorigenesis. Genome Biol. 2015; 16:139-15

Fath MK, Azrgoonjahromi A, Soofi A et. al. Current understanding of epigenetics role in melanoma treatment and resistance. *Cancer Cell International*. 2022; 22:313-36

Flesher J.L., Fisher D.E. G9a: An Emerging Epigenetic Target for Melanoma Therapy. *Epigenomes* 2021; 5:23-31.

Filho RSO, Peixoto GR, Sangiuliano LDC, Oliveira DA. Notch receptors as a therapeutic target in melanoma: a narrative bibliographic review. *Braz. J. Nat. Sci* [Internet]. 2021; 4:614-28. https://doi.org/10.31415/bjns.v4i1.138.

Golan T., Levy C. Negative regulatory loop between microphtalmia-associated transcription fator (MITF) and notch signaling. *Int. J. Mol. Sci*. 2019; 20:576.

Gupta R., Janostiak R., Wajapeyee N. Transcriptional regulators and alterations that drive melanoma initiation and progression. *Oncogene* 2020; 39:7093-7105.

Harel T, Lupski JR. Genomic disorders 20 years on-mechanisms for clinical manifestations. *Clin Genet* [Internet]. 2021; 93:439-49. https://doi.org/10.1111/cge.13146.

Haebe J.R., Bergin C.J., 1,2, Sandouka T., Benoit Y.D. Emerging role of G9a in cancer stemness and promises as a therapeutic target. ONLINE. Oncogenesis (2021) 10:76; https://doi.org/10.1038/s41389-021-00370-7

Kato S., Weng Q.Y., Insco M.L., et al. Gain-of-function genetic alterations of G9a drives oncogenesis. *Cancer Discov*. 2020; 10:980-97.

Kelly G.M., Al-Ejeh F., McCuaig R., et al. G9a inhibition enhances checkpoint inhibitor blockage response in melanoma. Clin Cancer Res. 2021; 27:2624-35.

Hoy SM. Tazemetostat: First approval. *Drugs*. 2020; 80:513-21.

Liao Q, Yang J, Ge S, Chai P, Fan J, R J. Novel insights into histone lysine methyltransferases in cancer therapy: From epigenetic regulation to selective drugs. *J Pharm Anal*. 2023;13(2):127-4.

Liu F, Barsyte-Lovejoy D, Li F, Xiong Y, Korboukh V, Huang XP, et al. Discovery of an in vivo chemical probe of the lysine methyltransferases G9a and GLP. J Med Chem. 2013; 56:8931–42.

Liu CW, Hua K, Li K et al. Histone methyltransferase G9a drives chemotherapy resistance by regulating the glutamate-cysteine ligase catalytic subunit in head and neck squamous cell carcinoma. Mol. Cancer Ther. 107;16:1421-34.

Lopes J, Rodrigues CMP, Gaspar MM et al. Melanoma Management: From Epidemiology to Treatment and Latest Advances. Cancers (Basel). 2022 Oct; 14(19): 4652-76. oi: 10.3390/cancers14194652

Martin C, Zhang Y. The diverse functions of histone lysine methylation. *Nat.Rev.Mol.Cell Biol*. 2005;6:838-49.

Moran B, Silva R, Perry AS, Gallagher W. Epigenetics of malignant melanoma. *Semin Cancer Biol* [Internet]. 2021;51:80-88.https://doi.org/10.1016/j.semcancer.2017.10.006.

Nacev B.A., Feng L., Bagert J.D., et al. The expanding landscape of "oncohistone" mutations in human cancers. Nature. 2019; 567:473-8

Oliveira Filho RS, Gomes HC, Oliveira DA et al. Identification and Quantification of notch receptors in human cutaneous melanoma using molecular biology techniques: Literature review. Surgical and Experimental Pathology. 2020; 3:17-21.

Park K-S, Xiong Y, Yim H, et al. Discovery of the First-in-Ckass G9a/GLP Covalent Inhibitors. *J. Med. Chem.* 2022; 15:10506–22. Park

Porcelli L., Mazzotta A., Garofoli M., et al. Active notch protects MMAPK activated melanoma cells from MEK inhibitor cobimetinib. *Biomed. Pharmacother.* 2021; 133:111006.

Qin A and Zheng M. Advances in targeted therapy and immunotherapy for melanoma (Review). Exp Ther Med. 2023;26: 416-39.

Shain A.H., Bastian B.C. From melanocytes to melanomas. *Nat. Rev. Cancer*. 2016; 16:345-58.

Tang H , Xiao WR, Liao YY, Li L, et al. EGFL7 silencing inactivates the Notch signaling pathway; enhancing cell apoptosis and suppressing cell proliferation in human cutaneous melanoma. *Neoplasma* 2019; 66:187-96. https://doi.org/10.4149/neo_2018_180310N167. 21.

Yang Z., Qi Y., Lai N., et al. Notch1 signaling in melanoma cells promoted tumor-induced immunosuppression via upregulation of TGF-beta1. J. Exp. Clin. Cancer Res. 2018; 37:1-13.

Zhang K, Wong P, Salvaggio C, Salhi A, Osman I, Bedogni B. Synchronized targeting of Notch and ERBB signaling suppresses melanoma tumor growth through inhibition of Notch1 and ERBB3. *J Invest Dermatol* [Internet]. 2016; 136:464-72. https://doi.org/10.1016/j.jid.2015.11.006.

SEVEN
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The impact of destructive parental relationships on children's mental health

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ABSTRACT
This literature review seeks to understand destructive parental relationships, contextualizing these relationships, not forgetting the concepts necessary to understand the topic, such as the classification of different types of abuse. The effects of destructive relationships and intrafamily abuse on the children's mental health and, finally, the short and long-term psychological consequences for victims of intrafamily abuse and the negative impacts that may arise in the future relationships of these children, who are adults, were also investigated. as children who grow up in environments of destructive parental relationships are more likely to develop emotional disorders, compromising their mental health and judgment to interrupt the cycle of violence. For the work to reach its objective, it was necessary to use books, articles, monographs, dissertations, among others, configuring a bibliographic research, which allowed the understanding of how harmful the abuses of destructive parental relationships are in the mental health of individuals and the need awareness of the signs of intrafamily abuse and measures that can be taken so that it does not happen or is repeated in future generations.

Keywords: Destructive Relationships, Gaslighting, Psychological Violence, Intrafamily Abuse.

1 INTRODUCTION

The theme of the present work is the impact of destructive parental relationships on the mental health of children, which in its great majority comes loaded with patterns of behaviors and attitudes that lead to physical and/or emotional abuse. Often the individual who finds himself within a destructive relationship, almost always has to deal with contradictory and often shameful feelings before recognizing and even realizing that he is living a destructive relationship.

Individuals who grow up in environments of destructive parental relationships are more likely to develop emotional disorders compromising not only mental health but also their discernment to interrupt the cycle of violence, since in many cases the abuse may be too subtle to be noticed.

The relevance of this study is due to the scarcity of discussions about the impact of manipulation and control in a relationship, making it essential that we know the behavioral patterns that cause abuse, be it physical, verbal, sexual or psychological, and knowledge is necessary so that through it it is possible to teach children how to avoid these abuses in their own lives.

Therefore, it is essential to learn to detect and identify these abuses within relationships, because our psyche is constituted by the relationships that we establish throughout our lives and once the subject can distinguish these behaviors it is possible to better understand the impact of these destructive relationships on the mental health of the individual himself and seek solutions for taking action, in order to minimize suffering and improve reality by interrupting the cycle of violence.

Thus, this work has as general objective to explain the harmful effects of parental relationships on the mental health of children, distributed in three specific objectives that aim to conceptualize a destructive relationship, contextualize the effects of the relationship on the mental health of children and discuss the negative impacts on the future relationships of these adult children.

As a methodology we used in this research a qualitative and descriptive bibliographic review, using books by the authors, Chimamanda Ngozi Adichie, Avery Neal, Jorgelina Albano and Dr. Robin Stern, considering the relevance of these authors within the chosen theme in addition to scientific publications of the last 10 years, using the database of the digital library SCIELO and searches of scientific publications in the Google Scholar platform, through the descriptors; destructive relationships, psychological violence, gaslighting, intrafamily abuse.

This monograph research is structured in five chapters from this introduction. A subsequent chapter referring to the theoretical conceptualization of a destructive relationship is subsequent, with the objective of identifying patterns of behavior of individuals who practice abuse and violence in their relationships. To make a parallel, the next chapter deals with the effects of such relationships on the mental health of children, followed by another chapter where it seeks to analyze the negative impacts on the future relationships of these adult children and ending the last chapter with the final considerations of all the research done during the work.

2 CONCEPTUALIZING A DESTRUCTIVE RELATIONSHIP

Domestic violence is a recurring issue in the public discussion, mainly because it brings up the issue of gender violence. This subject is of interest to all citizens, either because of the woman's potential to recognize herself in an abusive/destructive relationship, or perhaps to revise her concepts in child-rearing.

Violence is a serious social problem that affects the entire population. According to Day et al. (2003), domestic violence of an intrafamily nature is often accompanied by secrecy and denial. It is necessary to identify what the abuse would be, so that it can be typified in the destructive relationship. From there, it is possible to deal with the problem in intra-family relationships and its consequences on the mental health of children.

As well defined by Avery Neal (2018, p17.)

> Abuse is improper treatment or mistreatment... It happens in all types of relationships and includes any behavior or attitude whose intent is to frighten, intimidate, terrorize, manipulate, hurt, humiliate, blame, revile, or hurt someone. This includes all controlling or isolating behaviors.

It should be noted that there is no defined profile of an abuser, which makes it more difficult to identify them; and how abuse is prevalent across all races, ethnicities, age groups, religions, socioeconomic and family backgrounds; It's not a simple matter. With this, often relationships that do not seem right are confusing and it is imperative that people know what is an acceptable treatment or not (NEAL, 2018).

In this tuning fork brings to the fore a very widespread concept today that is *gaslighting*. It is a type of emotional manipulation, in which a gaslighter (*one who practices* gaslighting*, who needs to be right to preserve his own sense of identity and power in the world), tries to convince* the gaslightee love pair (which allows the *gaslighter* to define his sense of reality because he idealizes him and seeks his approval) that his memories are confused, or that you are misunderstanding or misinterpreting your own behavior and motivations, creating doubts in your mind that leave you vulnerable and confused. *Gaslighters* can be men or women, spouses or lovers, chefs or colleagues, parents or siblings, but what they all have in common is the ability to make the other question their own perceptions of reality. Gaslighting *is* always generated by two people: *a gaslighter, who sows confusion* and doubt, and a gaslightee, who is willing to doubt his own perceptions to maintain the relationship (STERN, 2019.).

Stern (2019) still points out to us that *gaslighting* can happen in various ways and that they will not always seem like an abuse, sometimes it presents itself in a very subtle way, even seeming a kindness, the author also mentions that although looking externally it seems a work of a single and abusive *gaslighter*, there is a mutual and continuous participation of the abuser with the subject who is being abused, which means that the person holds the key to get out of the situation of suffering in which he finds himself, although this is an arduous and difficult path.

As a consequence of living in an environment where relationships are abusive/destructive, the child/adolescent/child tends to repeat the pattern of maintaining a destructive relationship after growing up. Or they may intentionally try to avoid the same destructive dynamic they experienced in childhood by choosing a partner who mistreats them in a different way. Since "aggressive and controlling relationships are confusing when you are in them. Living in an abusive relationship is traumatic and the consequences difficult to manage" (NEAL, 2018, p.13).

It is necessary to understand that there are various forms of abuse and violence, and these are not only seen in loving relationships, but can extend to all types of bonds whether they are family or not. In the literature there are many studies that characterize the dimensions of abuse and violence and their consequences for the physical and mental health and well-being of the individuals involved.

It is known that the family is the first group in which the individual creates affective bonds and learns patterns of behaviors that will eventually guide his life for some time. Often the first indications of abuse and violence that a subject experiences come from the family institution. The family can be characterized by "a basic unit of development of experiences, of achievement or failure, of health or disease" (FERRARI, 2002, p. 28).

It is understood that abusive families are those that include violence in their dynamics, the characteristics of these families are; the secret, the silence, the social isolation, the lack of limits allowing the abuse of power and the omission in the exercise of the maternal/paternal function (BRASIL, 2001; Day et al., 2003; VIEIRA, 2015)

With regard to the various types of abuse and violence that occur within family institutions, the four most common forms of intrafamily violence are physical, psychological, neglect and sexual violence. Intrafamily violence can be defined as:

> Any action or omission that harms the well-being, physical, psychological integrity or freedom and right to full development of a family member. It can be committed inside and outside the home, by any member of the family who is in a power relationship with the person attacked. It also includes the function of father or mother, even without blood ties (DAY et al. 2003, p.10).

This means that in intrafamily violence the damage caused to the subject, be it physical, emotional, sexual, social, among others, will always be associated with an intimate and familiar bond between the victim and his aggressor and that its construction is done gradually within a historical, psychological and social context, being impossible to point out a single cause. It should also be noted that violence, whatever it may be, is always a matter of violation of human rights, being correlated to different problems, complex and of a different nature, that is, "violence is not a natural phenomenon as some want, but on the contrary, built and transmitted to the new generations" (FERRARI, 2002, p.75).

Physical violence consists of damage caused to the individual through physical force, usually aggressions such as slaps, kicks and beatings, and may also be through some type of weapon or instrument that can cause both external and internal injuries. The consequences of aggression affect the physical and emotional health of the individuals who are affected by it, being practiced more often with victims who are defenseless, unprotected, fragile and also applied with a disciplinary character. Thus, children, adolescents and women are more likely to suffer violence (BRASIL, 2001; DAY et al., 2003)

As Avery Neal put it, quoting Gavin De Becker in his book Virtues of Fear: Warning Signs That Protect Us from Violence.

> It is understandable that the perspectives of men and women on security are so diferentes_ men and women live in different worlds [...] deep down, men fear that women will laugh at

them, while deep down, women fear that men will kill them (BECKER, 1999 apud NEAL, 2018, p.20).

In addition to the family, the individual is surrounded by various social groups throughout his life. Therefore, it is not up to us to try to understand the individual by a single aspect, that is, it is impossible to see him in isolation, since his identity is both individual and social, both working together at the same time in the formulation of a subject as a whole.

People live in a world built on the masculine as a universal umbrella and the only voice that stands out. They embody their masculine voice as the central axis of everything they do and assume it as given and immovable, because the other voice that should have been the threads of culture has been silenced, not only in their daily doing, but in their desires and freedom. And that's why it's important to be aware that "culture doesn't make people. People make the culture. If an entire humanity of women is not part of our culture, then we have to change our culture" (ADICHE, 2014, p.17).

Often the gender distinction confers on the masculine being more crude characteristics, that is, the man is seen as the holder of power and physical strength and the feminine being angelic characteristics, which refer to fragility and submission. These so-called masculine and feminine characteristics end up validating male domination over women as something normal in society and authorizing all kinds of violence against them, as if it were part of a natural phenomenon between men and women. In this way many women suffer physical and psychological violence from their loving peers and understand that it is an acceptable dynamic in their daily lives (LIMA, 2011).

By rescuing history it is possible to perceive that the struggle of women in relation to male physical and psychological domination comes from ancient times. All violence and oppression were rooted in society through the foundation of the traditional family model, which always brought the wife as the husband's property to produce children and take care of the house (MCCANN et al., 2019).

In this way both children and wives were the property of husbands. Children were seen as cheap investments of labor, which could generate good profits for men in the ruling classes. It was up to women to bear children by ensuring the cheap labor that men aspired to (MCCANN et al., 2019).

The women's struggle becomes a very significant and fundamental part of the class struggle. For it was only possible for the man to grow intellectually, financially and professionally in his tasks with paid work because the women were simultaneously performing a supportive, unpaid work of all domestic activities related to the maintenance of the house, as well as of its residents, that is, it is easy to understand that both jobs are equally necessary, although only one is actually valued (MCCANN et al., 2019).

According to Stern (2019), emotional abuse is very commonly accepted as character building and from there everything is allowed. Violence then determines the pattern of intrafamily relationships; Emphasizing that by violence, it is understood the concept of hierarchical asymmetric relationship, of

power with the purpose of domination, exploitation and the denial of the freedom and equality of the other.

The main way of reproduction of abusive behaviors is communication, through phrases such as; "It's for your own good", "No one will believe you", "Deep down you like it", "You need to learn things from an early age". These phrases are said at times when the child goes towards the adult, seeking affection and protection, but receives humiliation, disrespect and violence. Often this visible difficulty of communication can be a result of the lack of limit of the parents, but on the other hand it may be because they can not (or do not know) find other ways to communicate the feelings, as a consequence the plot of silence is established, which favors the continuity and reproduction of violence. That is, all members maintain this silence. The child, because he thinks that no one can protect him, mainly because he sees the mother aware of the aggressions and does nothing to interrupt and the partner for fear of reprisals or of losing the love of the aggressor. The family itself has difficulties recognizing and accepting limits including itself in a relationship based on mind games in which the aggressor has the ability to distort things, lack of responsibility, depreciation and use of the tactic of biting and blowing (ALBANO, 2020; NEAL, 2018).

> The abuser has a low level of empathy, he is unable to put himself in the shoes of others [...] Their value system is completely distorted. Abusers often do not respond to the needs of their partner or children. Everything revolves around him, and if he feels harmed [...] he will probably cause problems. For one abuser, the needs of the other are at least inconvenient (NEAL. 2018, p.37).

In this way it is important to have the understanding that the victims of a destructive relationship, loaded with violence and abuse do not enter into such relationships aware of what the relationship will become. As explained earlier, these abusive relationships are established gradually and in subtle ways and get worse over time, making it impossible for the victim without any prior knowledge of the signs of what would be an abusive relationship to perceive within them. That is why it is important to conceive of what would be a destructive relationship, the analysis of the signs, the patterns of behavior that in the course of coexistence walk in the opposite direction to the goal of an ideal relationship where both feel respected and valued.

3 THE EFFECTS OF THE DESTRUCTIVE RELATIONSHIP ON THE MENTAL HEALTH OF CHILDREN

It becomes necessary to highlight the importance of beliefs in defining the roles of our society, the world divided between male and female; A dichotomy that turned out to be functional for the maintenance of certain rules and ignored the essence to focus on the roles that each one should assume. In this way it is imperative to emphasize that sons and daughters of couples who live destructive relationships suffer intense interference of this relationship not only in their mental health but also in

their ability to break the cycle of abuse and establish healthy relationships (ADICHE, 2014; ALBANO, 2020; NEAL, 2018).

It is known that some destructive relationships are established between a woman with abusive behavior and a man being a victim of such a situation, but in its vast majority such relationships are constituted of an abusive man - in view of the structural machismo and the cultural patriarchy in which we are inserted - and the woman who, being placed in the role of submissive, victim of the situation. Because of this, the analysis to be made focuses primarily on the consequences of living in an abusive routine on women's mental health (NEAL, 2018; STERN, 2019).

According to Neal (2018), the most important thing one can do for a daughter is to set an example of healthy relationships at home. That's where it all starts. Some girls from abusive families end up becoming extremely firm and do not tolerate anyone messing with them. But this is by far an exception to the rule. Most girls grow up observing their mother's behavior in the family relationship, then reproduce the same attitudes in their own relationship.

It is important to emphasize that experiences that include dynamics of mistreatment and abuse tend to prolong generation after generation. Children who witness and experience the scenarios of a destructive family dynamic end up being influenced by the choices of partners for relationships and marriages they will have as adults. Once these experiences of the family of origin return in a new scenario of a new marital relationship, these cycles of intrafamily abuse can be seen as an acceptable manifestation creating a condition of affinity on the part of the couple (LIMA, 2011).

Albano (2020, p.19), introduces the concept of destructive relationship with the following definition:

> To be in hell is to believe that we cannot choose. To be in hell is to believe that the social duty received is an inexorable truth that we cannot change. To be in hell is to live stuck in the molds, the duties, the inherited behaviors and a worldview in which only men can choose the kind of future they want to build outside the home. To be in hell is to feel that the world advances around us, but that we are quiet. To be in hell is to wish to occupy a place that once seemed to be a dream, but not to encourage us to go beyond the limits to transit the path that leads us there.

When a girl watches her mother bow to her father in the relationship she is not expected to be assertive with her boyfriend, moreover, if she is tired of seeing the mother try to explain herself and hope that the father allows himself to do what she really wanted the daughter will believe that she is powerless to make her own decisions. If she witnessed the mother let her husband make all the decisions so as not to provoke arguments, the daughter will doubt her own abilities small and large. If the girl witnessed her father talking to her mother in a degrading manner or assaulting her to teach her a lesson, not only will she probably believe that her mother deserved it when he blames her for provoking him, but she will also be much more likely to tolerate someone treating her in exactly the

same way. As the daughter sees her mother slowly disappear into the darkness, she will believe that this is her fate as well (NEAL, 2018).

Intrafamily violence determines an abusive relationship pattern. It is an action that involves the loss of autonomy, so that people are deprived of manifesting their will, submitting to the desire of the other. It is the denial of the freedom of the other, of equality. This behavior is derived from patriarchal beliefs that include both men and women, and there are still many women who join the voices of patriarchal males, perpetuating the threat to female freedom, in this way it is oriented that women, understand and accept that men treat them in a rude, disrespectful and abusive way, as being "normal" of the male sex, and it is up to the woman to accept with submissiveness and passivity, because it would be the "normal" of the feminine (ALBANO, 2020; NEAL 2018).

In typifying abuse we have; physical abuse or violence; characterized by the use of physical force, causing pain, can be practiced using the body itself giving slaps, kicks or with the use of objects to assist in aggressions, beatings and beatings (GOMIDE, 2010; PAIVA, 2014).

Sexual coercion consists of adopting threatening and insistent behaviors involving or not the use of physical violence, whose intention is to make the person who is suffering the coercion submit to sexual interaction against his will with the one who practices it (PAIVA, 2014).

Sexual abuse can be explicit, involving vaginal penetration, anal, oral sex or masturbation or, implicit or covert, this almost always relates to abuse committed against children and adolescents, includes exposure to sexual scenes inappropriate for their age or sexual suggestions may be from a masturbation, or the act of having sex in front of the child, or display pornography independently in any way, because the abuser sees his victims not as a person, but only as objects to obtain their pleasure and arousal, that is, regardless of whether or not physical-sexual contact occurs, both cases explained above are considered sexual abuse (ANTONI et al., 2011; PAIVA, 2014).

Psychological or emotional abuse is considered one of the most prevalent types of abuse and difficult to be reported or even perceived by individuals who suffer from this type of abuse, as it often comes in a very subtle way. The term *gaslighting* already explained and exemplified in the previous chapter of the present work constitutes a type commonly used for the practice of psychological or emotional abuse. It is noted that the violence practiced in psychological abuse can be verbal or through actions that always consist of humiliation, depreciation or degradation of the individual, in order to cause psychological suffering in the other person (BRAZIL, 2001; PAIVA, 2014; STERN, 2019).

Neglect can be physical, medical and emotional, is a type of abuse characterized by the omission of care and responsibility to those who need help is configured when parents or guardians fail to promote health care, nutrition, personal hygiene, education, housing, support and emotional support, promoting situations that disfavor the healthy development of children, not protecting them from aversive situations (BRASIL, 2001; Day et al., 2003; GOMIDE, 2010).

Such behaviors when experienced by children as a result of a destructive relationship, where violence prevails, cause short- and long-term consequences. Short-term: Physical problems; problems in the development of attachment and affection relationships (avoidance and resistance to attachment, social isolation behavior with deprivation of socialization, depression, self-esteem problem, inadequate reaction to stress); poor perception of oneself, problems in understanding and accepting the emotions of the other (BRASIL, 2001; DAY et al. 2003).

In the long term: They become abusive parents; many engage in criminal conduct; they place the wills of others over their own priorities; he prefers to endure undignified situations rather than put an end to it; difficulty in feeling that they belong somewhere; they hide what they feel; difficulty in making commitments; fear of making mistakes (BRAZIL, 2001; DAY *et al*. 2003).

It should be emphasized that communication is the basis of the transmission of the concepts of mistaken values that perpetuate the cycle of intrafamily violence. From childhood to adulthood, from parents to loving partners, it is common for women to grow up and have to live suffocating their ideas and thoughts, living daily with neglect and oppression in moments that should be of affection, support and protection, when hearing phrases of the type; "who is going to believe you", "stop drama", "you have to learn things from an early age", "this is not a girl's thing", "right girl does not do this", "deep down you like it" (NEAL. 2018).

To build an egalitarian society and that there are no gender-based power relations, which would consequently move towards the establishment of healthier relationships, a new stance and a real desire for this to happen is necessary. Cultural constructs of what one should or should not be are hard to ban, it's a fact. But it is necessary to generate a new identity in boys and girls. It is necessary to teach sons, especially daughters, that they are not limited to motherhood and home. That they should not apologize for working and that motherhood and work are not mutually exclusive. That the work of taking care of the house and the children has no gender. Teach that both can do everything that biology does not prevent them (ADICHE, 2017).

Women have been taught that to be a mother is to be a woman, they have been taught that they will only be happy and complete with motherhood, they have been taught that this is the biological role of women, they have been taught to avoid independent thoughts and behaviors, they have been encouraged to live seeing themselves as illogical, and in many matters incapable, but the compensation on this side is replaced by the "power" to bear children. And those who are against this thought are judged by an entire oppressive society. It is learned that it is not up to the woman to have control over her body, and her desires, it is not up to the woman to want or not to be a mother. But the damage caused by this oppression also affects the well-being of the children, considering the tensions within the family. A woman who is a mother without desire remains castrated socially, sexually and culturally, living as a slave or as a domestic animal (GREER 1975).

The woman who chooses, for example, not to be a mother is massacred on all sides. The value of the woman is measured by the ability to reproduce, since she does not have or does not want, all her qualities, competencies and capacities are invalidated (MCCANN et al. 2019).

Society needs to abandon the language of "help," for neither men nor women deserve praise or special gratitude since both have chosen to put a child in the world. One must understand that gender roles are absurd and that marriage is not a prize for women. (ADICHIE, 2014)

Neal (2018), points out the importance of teaching women, while they are young, the first warning signs of an abusive relationship. According to the author, most girls (as well as the general population) think that the abusive relationship is one in which the woman suffers physical violence. Tragically, this narrow definition leaves many girls vulnerable as they unconsciously expose themselves to all other types of abuse.

We need to teach about subtle abuse in early adolescence, before our daughters can commit to the relationship. When girls are taught the basics of abusive relationships and how to detect if they live in such a relationship before they commit, they will be much more receptive to information because they will be less defensive. Just as we learn that we should teach them about sexual predators, we need to teach them about aggressive and controlling relationships (NEAL, 2018).

Passing on knowledge to girls about how a destructive relationship is configured is extremely important and helps in two very significant purposes that become indispensable to minimize the effects of these relationships in their lives (NEAL, 2018).

Initially it is necessary to clarify what are acceptable behaviors or not, because most girls do not realize the abusive behavior and have no idea what to expect from a relationship. It is necessary to give support and make sure that the daughter feels supported and safe. With this the daughter will understand that she will not be alone, because from an early age the mother gave her permission to prioritize her life and abandon a harmful dynamic, teaching her how to recognize it. With support and approval it is much more likely that the girl will actually end a situation harmful to herself (ADICHE, 2017; NEAL 2018).

The second purpose concerns the formation of the boys. The fewer girls remain willing to submit to any type of abusive behavior, the more likely it will be that boys will be forced to change negative behaviors (ADICHE, 2017; NEAL 2018).

It is known that this change does not happen immediately overnight, but it is essential and possible that reality changes if girls become more assertive causing a reparation in bad behavior and ending the relationship when it is unhealthy. Girls urgently need to be aware of the power and strength they have (NEAL, 2018).

4 THE NEGATIVE IMPACTS ON THE FUTURE RELATIONSHIPS OF THESE ADULT CHILDRENS

It should be noted that in fact there is no exact term that can cover all types of abuse accurately, especially when one wishes to include and emphasize emotional abuse and its impact. Violence, whether physical or psychological, is always characterized by humiliation, containing numerous sources of heartbreak and in the case of emotional violence, there are reports that these are worse than any type of physical violence, with the capacity to annihilate the subject as a human, ending his subjectivity and identity (BENGHOZI, 2021; NEAL, 2018).

Emotional abuse is always loaded with humiliating and degrading language and behavior, causing enormous damage to the individual who lives in an abusive dynamic. This always has its values and its personality annulled and its freedom is restricted, since the dynamics of abusive relationships includes; threats, insults, constant vigilance of every step, fear, isolation, persecution, excessive messages... All of this affects the emotional well-being of the victim of this destructive relationship (NEAL 2018).

Cruz (2020), points to the fact that the consequences of this invisible violence are devastating for the victims, its psychological effects are greater and more painful than the physical effects, since often the women who can perceive that they are being victims of psychological abuse do not have a consolidated support network to act in the aid of their recovery, Even when they seek legal and police help, they are often ignored, which further aggravates the problem, evidencing the invisibility of a violence that is capable of causing often irreversible damage to women's mental health.

The signs begin slowly, they are always restrictive of the woman's freedom. In general, they do not begin in coexistence, but from the moment the relationship takes shape. The aggressor tries to seduce the woman so that she stops seeing her friends, so that they have no friends and for the sake of love and trust, tell her everything. He shows himself as someone who saves her life and she will always feel indebted to him (ALBANO, 2020, NEAL, 2018).

According to Albano (2020), these beliefs come from the idea of romantic love, with which we grew up, love in which there is always a man who rescues the woman. Also of the religious belief of the family as something untouchable, as a structure that must be maintained in any way. A woman's great pain is not abuse, but accepting that she has been mistreated, acknowledging the fact, and telling herself.

In many cases it ends up being common, as effects of emotional abuse, ideation and suicide attempt this along with a considerable decrease in the woman's self-esteem, the development of depression, phobia, post-traumatic stress, psychic disruption, excessive consumption of alcohol and drugs among others, always complex and devastating culminating in irreparable damage to psychological integrity (CRUZ, 2020).

It is necessary to understand that the devaluation began long before the first blow or the first insult, began in early childhood, without the need to be beaten, but with gestures that made that girl realize that she was not worth much, simply because an adult made her shut up or did not respect her opinion just because she was a girl. A father or a mother who says that the daughter "serves no purpose", that she "only does nonsense", or that "she is too small to opine" about something, is devaluing her, placing her in a category of lesser importance than that of the father, the mother, or any adult who has contact with this girl (ALBANO 2020).

The family is a group that should bring to the child all the necessary support for him to have a healthy physical and mental development, because it is identified as the first environment in which the child participates effectively through his face-to-face relationships, experiencing situations, feelings and performing tasks together that should promote the well-being of all its members, but often the physical punishments given to children in the family context justified in its great majority as a necessary and educational practice is shown to be detrimental to the healthy development of children, domestic violence has consequences at various stages of life and when growing up in a family, with an authoritarian parenting style, with such destructive dynamics these children, as adults, they end up unconsciously entering into relationships that maintain the pattern of abuse, thus perpetuating the destructive relationships of their intimate relationships (JERONYMO et al., 2009).

It is common for abuse in relationships to begin gradually and very subtly and usually the victim is blamed for such behaviors of their peers, there is a legitimation of male violent behaviors against women located in a social, historical and economic context where both play different roles and opportunities, also obtaining a very different social position from each other and violence is evidenced by a posture of competitiveness, control and power, so that men understand that they have the right to resort to violence in order to control and dominate their partners (CHARITY, 2006).

Often violence in relationships can also be misinterpreted by some peers as an act of love, demonstration of affection and care, others justify the abuse due to the conduct of women attributing the use of violence to external causes and out of the control of the abuser, it is worth emphasizing here the danger that is this misinterpretation of abuse in relationships because once jealousy is confused with love, validating the use of violence in any of these cases, violence is manifested and accepted as something normal in their relationships (CARIDADE, 2006).

It is necessary to understand that abuse is a game for the abuser that he manipulates so that he always wins. He makes the rules and doesn't stop until he wins, because winning means having power and control, which are the most important things to him. An abuser is an intimidator trying to make the woman feel small so that he feels bigger. In this way the woman is always in a position of submission and dependence on her partner (ALBANO; 2020. NEAL, 2018).

It can be affirmed that intrafamily violence causes negative impacts on the entire structure of these women victims of these destructive relationships. There is no doubt that intrafamily violence and emotional abuse constitute a serious health problem, both physical and mental, being a serious obstacle to social and economic development, in addition to being an incontestable violation of human rights (BRASIL, 2001).

When a woman accepts what the oppressive society imposes on her, when there are patterns of behavior entitled feminine behaviors or masculine behaviors, that is, there are acceptable behaviors in boys and girls, when she teaches her daughter that it is right for her to shrink and give in to male needs, the negative impact on this woman's life is gigantic and interferes with all her relationships. Since it is up to the woman to satisfy the man, even if for that she needs to annul herself completely and that single women are considered failures, what we have are; many women with acceptance problems, with low self-esteem, a tendency to give up their rights for not knowing them and to accept any kind of violation in an attempt to be good wives, good daughters, in an attempt to be valued and accepted (ADICHE, 2014).

Women are victims, they are mistreated by their partners, they are misunderstood as a social being with needs and wills of their own. As long as men deny women independent thinking, they will continue to hold power, keeping women enslaved, submissive to them, dependent on them for everything (MCCANN, 2019).

While single women are considered failures, married women have the illusion of having a better social status, but they are always regarded as inferior to their husbands, even if there is a mutual interest in building a successful marriage together (MCCANN, 2019).

Women who give up their wills, who give up their careers and their intellectual opportunities, for example, to take care of the house and dedicate themselves full-time to the care of children, are considered domestic servants, while women who work outside the home are elevated to the position of partners, since they contribute materially to the support of the family (MCCANN, 2019).

However, even with social achievements and work outside the home, women are still strongly associated with household chores, childcare and household care. Once they gain the autonomy to work outside the home, they start to have a "double shift" of work and have to account for their domestic "obligations", simultaneously exercising work activities at home, without losing their commitment to employment outside the home (LUCAS et al. 2020).

> The very idea of "working outside" starts from the principle that women, as if by nature, only have the space of the home and the activities that concern it, such as the care of children and the preparation of food. It was concluded, then, that not only the public/private binomial needs to be dismantled, things that feminists have long taught us, but also the binomial inside/outside (LUCAS et al. 2020, p.104).

The financial instability of women victims of destructive relationships is an aggravating factor that prevents the breaking of the cycle of violence and the liberation of these women. Men earn more than women, are usually inserted in the labor market longer, while women suffer from financial insecurity and are dependent on these men who are the authors of the abuses practiced with them (MCCANN, 2019 - BRASIL 2001).

The poverty of women who are victims of structural oppression causes them to lose their dignity and security. When oppressive institutions and society limit women's economic resources and opportunities and they are forced to work for less pay than they need to survive, it is up to women only to sacrifice themselves for a wage, even if it means endangering their physical or mental health, even if it means giving up their dignity and security. increasingly annihilating their self-love and self-esteem (MCCANN, 2019).

It should be emphasized that many of the damages caused by intrafamily violence and emotional abuse, not only affect the direct victims of this destructive relationship, that is, the sons and daughters of mothers who suffer emotional abuse and intrafamily violence, are more likely to; getting sick, abandoning studies early, developing difficulties in social skills, difficulties in establishing economically, among others (BRASIL, 2001).

Women who manage to break free from a destructive relationship do not emerge unscathed and without sequelae from the exhausting life they had with their abusers. Unfortunately it is common for freedom to be accompanied by a period of feeling anxiety, fear, excessive worry, panic or insomnia, lack of interest in things that normally give pleasure, feeling of defeat among other symptoms that are part of anxiety and depression. There is also a great tendency to stress and the real difficulty of relating again with someone (NEAL, 2018).

Neal (2018) reveals that, abuse is so traumatic that physical symptoms of illness, or injury are not rare and that unfortunately post-traumatic stress after an abusive relationship can last for years and that the longer one lives in an abusive relationship, the more powerless the person feels.

It should be noted that getting out of an abusive relationship is not easy, as has been previously mentioned the dynamics of these relationships involve the victim causing codependency and financial dependence. There is a feeling of sadness, for not being strong enough to leave the relationship, there is embarrassment, for exposing their weaknesses and pains experienced in the family environment, there is emotional and financial insecurity, there is a fear of everything they will have to face to get out of the situation that afflicts them so much. (ALBANO, 2020. NEAL, 2018)

5 FINAL CONSIDERATIONS

Conceptualizing and understanding the characteristics of destructive relationships and their consequences on mental health is important for a movement to break the cycle of violence to happen.

It is believed that the present work contributed to assist in the beginning of this process, through the identification of the different types of abuses and abusers and the characterization of the behaviors that generate conflicts that configure a destructive family dynamic.

It is necessary to break the paradigm that dictates the definitions of male and female roles so that the fight against violence against women happens in a structural and institutional way, proposing changes in the logic of thinking and understanding. Women need to understand and identify early warning signs of different types of abuse, to minimize the negative impacts and destructive effects that these behaviors bring to the lives and health of victims and to maximize action in order to promote the denaturalization of the use of violence in their relationships and as well as to learn to re-signify their experiences to promote the possibility of moving forward for well-being physical and emotional.

Very little is discussed about the impact of manipulation and control in a relationship, especially with regard to the impacts caused on children from these relationships, it is likely that the considerations presented in the present work do not equate to the full dimension of the problem, but may offer a basis for a deepening of the content, since the information obtained in the bibliographic review research adopted for this work sought to give something tangible to which cling with clear and objective information in an attempt to guide those involved through the treacherous waters of this type of relationship, helping to come out of it with a greater sense of being worth in the world.

REFERENCES

ADICHIE, Chimamanda Ngozi. Para Educar Crianças Feministas: Um manifesto. Tradução Denise Bottmann. 1 ed. São Paulo: Companhia das Letras, 2017. Tradução de: Dear Ijeawele, or A Feminist: Manifesto in Fifteen Suggestions.

ADICHIE, Chimamanda Ngozi. Sejamos Todos Feministas. Kindle ed. Companhia das Letras, 2014. 37 p.

ALBANO, Jorgelina. Sapatos Vermelhos são de Puta: Desafiando as crenças do patriarcado. Tradução Marcia Blasques. 1 ed. Bauru, SP: Astral Cultural , 2020. 240 p. Tradução de: Los zapatos rojos son de puta.

ANTONI, Clarissa De *et al*. Abuso sexual extrafamiliar: percepções das mães de vítimas. Estudos de Psicologia. Campinas, 2011, p. 97-106. Disponível em: https://www.scielo.br/j/estpsi/a/vSgt3WFX8qSpCSqL7Rpn4gb/?lang=pt&format=pdf. Acesso em: 6 nov. 2021.

BENGHOZI, Pierre. RESILIÊNCIA FAMILIAR E CONJUGAL NUMA PERSPECTIVA PSICANALÍTICA DOS LAÇOS. Psicologia Clinica. Rio de Janeiro, 2015, p. 101-109. Disponível em: https://www.scielo.br/j/pc/a/RfVgsHKCfTWQt3GGQm95rns/?format=pdf&lang=pt. Acesso em: 4 nov. 2021.

BRASIL. Ministério da Saúde. Série Cadernos de Atenção Básica; n. 8. Violência intrafamiliar: orientações para prática em serviço. Brasília, DF. Secretária de Políticas de Saúde: MS, 2001.

CARIDADE, Sonia ; MACHADO, Carla . Violência na intimidade Juvenil: Da vítima à perpetração. Análise psicológica. 2006, p. 485-493. Disponível em: http://publicacoes.ispa.pt/index.php/ap/article/viewFile/541/pdf. Acesso em: 7 nov. 2021.

CRUZ, Mariana Franco . Violência psicológica contra a mulher: da invisibilidade à violação dos direitos da personalidade . UniCesumar. Maringá, 2020. 122 p. Disponível em: . Acesso em: 7 nov. 2021.

DAY, Vivian Peres. Violência doméstica e suas diferentes manifestações. Scielo. Rio Grande do Sul, 2004. Disponível em: https://www.scielo.br/j/rprs/a/5SdJkYSszKYNdzcftfbbRTL/?lang=pt. Acesso em: 27 ago. 2021.

FERRARI, Dalka Chaves de Almeida; VECINA, Tereza Cristina Cruz. O fim do silêncio na violência familiar: teoria e prática. Editora Agora, v. 1, f. 165, 2001. 330 p.

GOMIDE, Paula Inez Cunha. Abuso negligência e parricídio: um estudo de caso. Temas em psicologia. Ribeirão Preto, p. 219- 230. Disponível em: https://www.redalyc.org/pdf/5137/513751435018.pdf. Acesso em: 5 nov. 2021.

GREER, Germaine. A Mulher Eunuco. Círculo do Livro, 1975. 436 p.

JERONYMO, Daniela Viganó Zanoti *et al*. Prevalência de abuso físico na infância e exposição à violência parental em uma amostra brasileira. Cad. Saúde Pública. Rio de Janeiro, 2009. Disponível em: https://www.scielo.br/j/csp/a/ZXnSJzvGhBgRKgD8znB5GRP/?lang=pt&format=pdf. Acesso em: 1 nov. 2021.

LIMA, Gabriela Quadros de ; WERLANG, Blanca Suzana Guevara. Mulheres que sofrem violência doméstica: Contribuições da psicanálise. Psicologia em Estudo. Maringa, 2011, p. 511-520. Disponível em: https://www.scielo.br/j/pe/a/GShYc5SHq9SVcrwbyXxbSbT/?lang=pt&format=pdf. Acesso em: 5 nov. 2021.

LUCAS, Carlos Henrique de *et al*. "A louca dos gatos"ou sobre como gaslaitear o feminino: um estudo sobre a violência psicológica no âmbito do gênero. Locus - Revista de História. Juiz de Fora, 2020. 122 p. Disponível em: https://periodicos.ufjf.br/index.php/locus/article/view/29808/20511. Acesso em: 9 out. 2021.

MCCANN, Hannah *et al*. O livro do Feminismo. Tradução Ana Rodrigues. 1 ed. Rio de Janeiro: Globo Livros, 2019. 352 p. (As grandes ideias de todos os tempos). Tradução de: The Feminism Book.

NEAL, Avery. Relações Destrutivas: Se ele é bom assim, porque eu me sinto tão mal?. Tradução Sandra Martha Dolinsky. 1 ed. São Paulo: Gente, 2018. 256 p. Tradução de: If he's so great, wy do I feel so bad?.

PAIVA, Carla ; FIGUEIREDO, Bárbara. Abuso no relacionamento íntimo: Estudo de prelavalência em jovens adultos portugueses. Psychologica. Coimbra, 2004, p. 75-107. Disponível em: https://repositorium.sdum.uminho.pt/bitstream/1822/4211/1/Abuso%20no%20relacionamento%20%282004%29.pdf. Acesso em: 4 nov. 2021.

STERN, Dra Robin. O Efeito Gaslight: Como identificar e sobreviver à manipulação velada que os outros usam para controlar sua vida. Tradução Wendy Campos. 1 ed. Rio de Janeiro: Alta Books, 2019. 304 p. Tradução de: The Gaslight Effect.

Collaboration of neuroscience in the care of victims of traumatic brain injury

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ABSTRACT
TEC is an injury that has been investigated mainly in terms of epidemiological aspects and care protocols. Neuroscience aims to study the nervous system, its embryonic and histological formation, as well as the connection of the physiology of the whole body, for which it has collaborated to understand the stimulus-response mechanisms, a mechanism that is important to understand the body's response. human in injuries such as TEC. Based on this principle, the problem raised for this research was: What care is offered to TEC victims and the collaboration of neuroscience. Therefore, the main objective of this study was to describe the pathophysiology of TEC, the therapeutic support for victims of this condition and the collaboration of neuroscience. This study is an integrative review. Therefore, the following guiding question was elaborated: What care is offered to patients who are victims of TEC and the collaboration of neuroscience. motor, sensory, cognitive, language, emotional or even behavioral.

Keywords: Traumatic, Brain Injury, Neurosciences, Surgery.

1 INTRODUCTION

Traumatic brain injury (TBI) is defined as an injury resulting from an external force where it can make the brain go against the skull. At the research level, the epidemiological numbers of TBI in Brazil have a shortage due to several situations such as underreporting (CIPOLAT, 2022).

> [...] As for the pathophysiology, it can be divided into two phases. The first corresponds to brain injury, which is characterized by tissue trauma and dysregulation of brain blood flow and metabolism, in this case there is tissue ischemia, which occurs due to an accumulation of lactic acid from anaerobic glucose, which leads to an increase in cell membrane permeability

> and consequent tissue edema. In the second phase, the cascade of events begins with a terminal depolarization of the membrane along with the excessive release of excitatory neurotransmitters, which activate receptors and open the sodium-dependent and calcium-dependent channels (MACHADO; CHAMBER, 2019). [...]

At first after the lesion installed in the brain tissue is the shear stress at the axon level and may also cause the rupture of local cell membranes, in both situations may occur secondary event of pathophysiology as rapid and disorganized depolarization, which leads to the release of neurotransmitters of the type stimulants in the synaptic cleft we can cite as an example the Glutamate (CIPOLAT, 2022).

> [...] The lesion caused by TBI can affect the skull, its envelopes and its contents and be classified into cerebral contusion and concussion, traumatic subarachnoid hemorrhage, hypoxia brain injury, brain swelling, diffuse axonal injury, fractures and perforating skull injuries. Regarding intracranial hemorrhagic lesions, they can be differentiated into multiple focal vascular lesion, subarachnoid hemorrhage, intraventricular hemorrhage, extradural hematoma, subdural hematoma (acute and chronic), intracerebral hematoma and lobar explosion (ROCHA et al., 2020). [...]

It is important to note that TBI not only causes internal damage such as concussion, but also has structural consequences of the skull such as laceration of scalp, local or diffuse fracture, meningeal inflammation and even at the vascular level that would be an expected event categorized as primary in the pathophysiology of TBI, these changes can further lead to transient or permanent cognitive or functional events (RAMOS et al., 2021).

In terms of categorizing the severity of TBI we know through a name ada Glasgow Coma Scale (GCS) where the TBI is classified as mild, moderate or severe. It is important that, in the initial approach of patients with TBI, all possible care is adopted, with scientific and clinical basis, since it will be a basis for treatment and prognosis. When performing the initial care it is necessary to perform an evaluation to categorize the state of severity of the trauma, paying attention to the airway, correct immobilization of the cervical spine, venous access as needed and maintain the patient's temperature still at the site of the event, so it is necessary to follow what the literature brings in the manuals and protocols (ROCHA et al., 2020).

Neuroscience aims to study the nervous system, its embryonic and histological formation as well as the connection of the physiology of the whole body, for this it has collaborated to understand the stimulus-response mechanisms, a mechanism that is important to understand the response of the human body in injuries such as TBI (FELICIANO, 2023).

Based on this principle, the problem raised for this research was: What care is offered to TBI patients and the collaboration of neuroscience. Thus, this study had as main objective to describe the pathophysiology of TBI, the therapeutic support for the victims of this disease and the collaboration of neuroscience.

2 METHODOLOGY

This study is an integrative review. Therefore, the following guiding question was elaborated: What care is offered to TBI patients and the collaboration of neuroscience. The operationalization of this research began with a consultation of the Descriptors in Health Sciences (DeCS), through the Virtual Health Library (VHL); and the Medical Subject Headings (MeSH) of the National Library, for knowledge of universal descriptors. Therefore, the controlled descriptors were used, in Portuguese: Traumatic Brain Injury and Neurosciences and Surgery.

The following inclusion criteria were defined: articles published in full, available electronically, in Portuguese, Spanish and English, whose results contemplated aspects related to head trauma or approach to patients with cranial and brain involvement. Newspapers and articles that did not fully contemplate the perspective of the study were excluded.

Articles were selected from April 2019 to 2023. Data collection was performed in two stages. The first consisted of the advanced search in the databases, detailing the quantity of the articles through scientific bases. After the selection and identification of the articles that met the determined inclusion criteria, prior reading of all titles, abstracts, 12 publications were selected. Therefore, the duplicate studies were computed only once, resulting in a sample of nine articles. After rereading each of the articles, an instrument was filled out with the following information: title, authors, journal, year of publication, objectives, methodology, research results, highlighting the care of patients with TBI and the collaboration of neuroscience, which are presented in summary.

Table 1 - Distribution of references included in the integrative review, according to scientific databases, in order of year of publication, 2023.

Article	Type of study	Goal
Scientific advances related to diseases of the Nervous System: neuroscience was the area where the greatest advances happened scientific in recent decades.	Literature review	To point out the evidence, the main scientific advances of neuroscience and their contribution to the treatment of the most frequent diseases; Neurological.
Paper of oxidative/inflammatory process in the pathophysiology induced by recurrent concussions in young rats.	Expiremental	Paper of oxidative/inflammatory process in the pathophysiology induced by recurrent concussions in young rats.
Fundamental neuroanatomophysiology.	Literature review	Facilitating tool for understanding the morphophysiological aspects of the nervous system.
Traumatic brain injury as a public health problem: an integrative literature review.	Integrative review	To investigate the contributing factors to make TBI a problem of Public Health and what are the consequences of this problem.
Nurse's performance in the care of patients who are victims of traumatic brain injury.	Bibliographic review, descriptive	To know the care provided by nurses to patients with traumatic brain injury in the hospital emergency service.

The importance of radiological examinations for the diagnosis of post-trauma cerebral hemorrhage.	Bibliographic review, descriptive	Creation of a book on Trauma and Emergency.
Pre-hospital care (PHC) for hemorrhage Exsanguinating Traumatic Brain Injury Related	Case report	To describe the experience of the nursing team in the care of patients who are victims of traumatic brain injury, based on protocols adopted in pre-hospital care aimed at improving the morbidity and mortality of this profile of patient/trauma.
Indication of urgent head CT in mild traumatic brain injury (TBI) in patients on anticoagulant or antiaggregant treatment.	pective observational cohort study	To detect differences in intracranial hemorrhagic complications between patients with mild TBI and those using anticoagulant or antiaggregant and patients without this treatment.
Practical contributions of the nursing process related to traumatic brain injury: An integrative review.	Integrative review	To analyze the international scientific evidence on the nursing process in the care of adults with traumatic brain injury.
Systematic review of randomized controlled trials for rehabilitation functional of traumatic brain injury.	Systematic review	To conduct a systematic review to evaluate the physiotherapeutic modalities that reestablish function more effectively in the treatment of patients with TBI.
Pupillary score of the Glasgow Coma Scale (GCS-P) and hospital mortality in severe traumatic brain injury: analysis of 1,066 Brazilian patients.	Prospective study	We evaluated the accuracy of the GCS-Pupil score (GCS-P) as a prognostic index towards predict hospital mortality in Brazilian patients with severe TBI and compare it with a model that combines GCS and pupillary response with clinical prognostic factors and additional radiological.
Evaluation of Pre-Hospital Time and Neurological Evolution in 30 Days of Patients Victims of Moderate and Severe Traumatic Brain Injury	Documental, prospective analysis	To associate the pre-hospital time with the outcomes of patients suffering from moderate and severe TBI in the first 30 days of hospital evolution.

Source: prepared by the authors according to the scientific databases in order of year of publication, 2023.

3 TRAUMA CRANIOENCEPHALIC: BASE NEUROSCIENTIFIC TOWARDS DRIVING THE VICTIM

TBI can be conceptualized as a more predominant trauma, as well as trauma where there is a high rate of death, referred to as a severe type of trauma, specifically, agent of 30 to 70% of the causes of death soon after the event. In addition, TBI, however, is the trauma that predominantly establishes morbidity as well as the evolution of the individual, where often these victims usually usually have very relevant sequelae in what deals with structural and/or organic involvement as well as the damage to the particularity of life (LARA, 2023).

Neuroscience provides health professionals mainly those who are linked to neurology and neurosurgery and a neurofunctional framework, since each anatomical structure has a response/function be it cognitive or motor, local or systemic for such, neuroscience applied to trauma

makes scientific thinking to subsidize the conducts in the face of TBI, technological advancement and neurointensive care came to be based on the exploration and applicability of neuroscience making care professionals a skilled technician in more advanced neurological practices (FELICIANO, 2023).

It is important to emphasize that a portion of the individuals who survive a TBI have the possibility of proceeding with permanent damages implying in motor, sensory, cognitive, language, emotional or even behavioral deficits. Research indicates that on average 50 to 75% of individuals with TBI manifest cognitive and even behavioral changes (RAMOS et al., 2021).

Still for Ramos et al (2021), when the patient is admitted to the traumatology service or in the emergency room, whether it is pre or hospital, whether his condition is serious or not, he will be attended by a team of health professionals where, most of the time, the management of care is by a nurse and shared the management of the scenario with the doctors. The care of the traumatized should be conducted by the Advanced Trauma Life Support (ATLS) protocol, this protocol was founded in the USA, where it provides immediate recognition and treatment in a sequenced way.

> [...] The severity of TBI is classified according to the Glasgow Coma Scale (GCS), whose parameters are obtained by eye opening, verbal response and motor response. This scale was described in 1974 by Teasdale and Jennet, who categorized TBI as severe a score from 3 to 8, moderate 9 to 12 and mild 13 to 15. Although the tests and evidence on TBI and its neurological sequelae are increasingly real, the population still does not take it seriously, because only 60% of patients who survive TBI are left with motor and cognitive impairments (SANTOS et al., 2021) [...]

Still for Santos et al (2021), it is necessary to evaluate the configuration of the care offered to individuals with TBI, where we need to attend in a welcoming way, with technical knowledge and based on the principles of humanization. We must emphasize the importance that public health policies have regarding the development of preventive strategies with association with external causes such as automobile accidents and drug and alcohol consumption.

4 DISCUSSIONS

The brain injury can be categorized into two stages where the first corresponds to an injury at the tissue level and with the disorder of blood flow in the brain as well as change at the metabolic level, it is in this situation that an ischemia occurs at the tissue level due to the accumulation of lactic acid due to anaerobic glucose, such an event causes the cell membrane to be more pervious and there time the tissue edema. When we approach the second phase of the lesion, the literature brings the cascading event where it begins through terminal depolarization of the cell membrane associated with a high release of excitatory neurotransmitter (MACHADO; CÂMARA, 2019) and (CIPOLAT 2022).

Concussion can be conceptualized as a change in brain functioning caused by an external energy. In the course of these past years until today, concussion has been investigated and given attention in the scientific world due to its discrete outcomes, which are able to unite and potentiate

some secondary injury. Studies point to an increase in secondary effects of concussion in adolescence, as well, it has been seen that it can induce in the constitution and metabolism at the neural level in adulthood as well as in different circumstances and pathologies (FELICIANO, 2023).

RAMOS et al (2021) and SANTOS et al (2021), point out the degree of severity of the trauma and through the ECG, where the eye opening, verbal, motor response and pupillary evaluation are evaluated, the TBI is classified as severe TBI scores from 3 to 8, the moderate from 9 to 12 and the mild we have 13 to 15 points. Driving should be based on ATLS as it brings evidence to identify, address and lead TBI victims.

CIPOLAT (2022) and FELICIANO (2023) point out the relevance of neurophysiology and neuroanatomy in the context of the approach to the patient with TBI, neuroscience in addition to addressing morphofunctional content, has neuroimaging, neuropharmacology and neurological physiology. Such contents need to be related to aggregate with the medical and nursing sciences, for example, to provide care to the individual.

5 FINAL CONSIDERATIONS

Given the above, it is necessary that professionals working in neurology, respectively neurotraumatology, is essential the knowledge of neuroscience for an approach with more solid knowledge about the structures and physiology of the nervous system.

REFERENCES

BERTOTTI, Melina Moré et al. Escore pupilar da escala de coma de Glasgow (GCS-P) e a mortalidade hospitalar no traumatismo cranioencefálico grave: análise de 1.066 pacientes brasileiros. Arquivos de Neuro-Psiquiatria , v. 81, n. 05, pág. 452-459, 2023.

CAVALHEIRO, Esper A. Avanços científicos relacionados às doenças do Sistema Nervoso: a neurociência foi a área onde aconteceram os maiores avanços científicos nas últimas décadas. Ciência e Cultura, v. 74, n. 4, p. 01-07, 2022.

CIPOLAT, Rafael Parcianello et al. Papel do processo oxidativo/inflamatório na fisiopatologia induzida por concussões recorrentes em ratos jovens. 2022.

CORTES, Angelica Johanna Jimenez et al. Indicação de TC de crânio urgente em traumatismo cranioencefálico (TCE) leve em pacientes em tratamento anticoagulante ou antiagregante. Seram , v. 1, não. 1, 2021.

CRUZ, João et al. Contribuições práticas do processo de enfermagem relacionado ao traumatismo cranioencefálico: Uma revisão integrativa. Enfermería Actual de Costa Rica, n. 43, 2022.

DE SOUZA, Gabriela Lopes; MENEZES-REIS, Rafael. Revisão sistemática de ensaios clínicos randomizados para reabilitação funcional do traumatismo cranioencefálico. Revista Neurociências, v. 31, p. 1-20, 2023.

DE LARA, Danielle e cols. Avaliação do Tempo Pré-Hospitalar e Evolução Neurológica em 30 Dias de Pacientes Vítimas de Traumatismo Cranioencefálico Moderado e Grave. J Bras Neurocirur , v. 34, n. 2, pág. 160-167, 2023.

DOS SANTOS, Wagner Ferreira et al. Relato de Caso Clínico: Atendimento Pré Hospitalar (APH) a Hemorragia Exsanguinante relacionada a Trauma Crânio Encefálico (TCE).

FELICIANO, Gláucio Diré. Neuroanatomofisiologia Fundamental. Freitas Bastos, 2023.

MACHADO, Moura;CÂMARA, Joseneide Teixeira. TRAUMA CRÂNIO ENCEFÁLICO COMO UM PROBLEMA DE SAÚDE PÚBLICA: uma revisão integrativa da literatura. In: ORGANIZADORES DO V CONGRESSO NACIONAL MULTIDISCIPLINAR DE SAÚDE.

RAMOS, Joyce Rodrigues et al. ATUAÇÃO DO ENFERMEIRO NO ATENDIMENTO AO PACIENTE VÍTIMA DE TRAUMATISMO CRÂNIO ENCEFÁLICO. Facit Business and Technology Journal, v. 1, n. 26, 2021.

ROCHA, Larissa Caroline F. et al. A IMPORTÂNCIA DE EXAMES RADIOLÓGICOS PARA DIAGNÓSTICO DE HEMORRAGIA CEREBRAL PÓS-TRAUMA. Editor

Patterns in data modeling: addressing common patterns and best practices

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ABSTRACT
This article addresses the importance of standardization in data modeling, as well as its impact on the quality of DBMS. Standardization encourages uniformity by following fixed guidelines, which facilitates comprehension and collaboration among teams. Additionally, we discuss how the normalization of primary keys and indexes enhances data integrity. Reliability is addressed, highlighting security, referential integrity, and traceability. Furthermore, the article under discussion covers best practices such as selecting the best data and adapting standardization to sources of questionable provenance, as inappropriate standardization can lead to errors, given that data might be incomplete precisely due to their origins from dubious sources. However, we acknowledge that selective standardization is crucial for complex data; we also address how standardization within data modeling contributes to a more efficient and accurate system. In summary, standardization in analysis reinforces confidence in the data. Nevertheless, it should be applied cautiously to preserve the original information.

Keywords: Data modeling, DBMS, standards and keys.

1 INTRODUCTION

In the vast arena of data modeling, it is imperative to adopt standards and best practices, especially when multiple hands shape a single project. The absence of standards can blur the line between effectiveness and inefficiency. Reflecting on the importance of standardization, Taiichi Ohno once remarked, "Where there is no standard, there can be no improvement."

Setting standards in data modeling is not just a matter of uniformity, but a necessity to create robust, high-performance systems. When there are pre-defined principles, the integrity of the information is preserved and enhanced, because all the data follows a common pattern. This, in turn, reduces the chances of ambiguities and conflicts during data analysis or interpretation.

In addition, by embracing standards and best practices, we are recognizing and avoiding common obstacles faced during data modeling. This translates into savings in time and resources, as well as a smoother learning curve for new team members. By recognizing the challenges that arise and

the standard solutions to address them, data modelers can focus their energy on more advanced innovations and optimizations.

The paper not only illuminates the challenges intrinsic to data modeling, but also suggests solutions based on proven design patterns. By diving into these concepts, we hope to continually facilitate and improve the intricate process of data modeling.

"You can't expect everything to be perfect, but you have to move forward in pursuit of continuous improvement."

Mário Sérgio Cortella, a Brazilian philosopher and educator.

2 THE IMPORTANCE OF STANDARDIZATION IN DATA MODELING

Incorporating standardization into data modeling is a crucial principle that goes beyond mere database structure design. It drives the quality and maintenance of database management systems (DBMS) more broadly, as well as driving efficiency and effectiveness. The essence of standardization lies in the robust application of guidelines, ensuring uniformity at every stage of the data lifecycle.

Moreover, when a set of rules and conventions are adopted, data models consequently become easier to understand and easier to predict. As a consequence, we have fewer double entendres which allows for better communication between the parties involved; Which generates a very important benefit: consistency in the design in the databases. In addition, standardization simplifies the regulatory maintenance of databases. Programmers have an interdependence of data elements (which decreases the risk of delays and errors). All this is only possible thanks to the coherent and super documented data structures, the updates and improvements that can be inserted in an agile and, above all, much more precise way.

Reasonableness is another solid foundation of standardization in data modeling. With this foundation, standardized data models can be applied to multiple projects, which leads to a decrease in time and resources. The standardization of the designs allows the structure to be reused, since it has already been evaluated previously. This makes it speed up development and ensures system quality more consistently. In addition, standardization has a direct influence on the performance and efficiency of databases. The application of practices such as standardization generates faster and more effective queries, which improves the end-user experience and increases the utilization of system resources.

Standardization in data modeling also plays a crucial role in ensuring data governance. Organizations establish a solid foundation for the management and control of their information assets through the definition and consistent application of standards. This causes the data to be treated in a better way. Another undeniable advantage of standardization is the facilitation of collaboration between professionals, since by adopting a standard, teams can work more efficiently, that is, standardization eliminates barriers to interpretation, which allows professionals from different areas to

extend the structure of the shared data. Additionally, standardization provides a solid basis for evolution over time. As companies/organizations grow, new requirements emerge, and standardized models make it easy to incorporate change without generating unwanted impacts. And consequently, it generates more flexible systems.

In addition, the implementation of standards in data modeling also has a positive effect on data quality. Given that when standardizing elements, the chance of errors decreases considerably; which results in more accurate and reliable data.

In summary, standardization in data modeling, in addition to influencing DBMS designs, also plays a key role in areas such as professional collaboration and systems evolution. By adopting this approach, companies/organizations form fixed foundations for continued success.

3 HOW STANDARDS IMPROVE DATA PERFORMANCE

Patterns in data modeling are recognized and tested solutions to recurring problems in this field, they are a way to ensure that information is stored in a consistent and standardized way, which can significantly improve database performance, helping to optimize data access, reducing redundancy and increasing the efficiency of queries. In addition, standards can help ensure data integrity by avoiding errors and inconsistencies, for example, a common standard is foreign key restriction, which ensures that related information in different tables is always synchronized.

Another common pattern is the use of indexes, which are data structures that allow you to quickly find specific information in the database, indexes can significantly improve query performance by allowing the database to quickly find the information it needs. In short, patterns are an important tool in data modeling, but how do Standards Improve Data Performance?

3.1 CONSISTENCY AND CLARITY

Standards establish consistent conventions and nomenclatures for data elements such as tables, columns, and relationships, this makes it easier for developers, administrators, and end users to understand the model, a clear and well-defined data structure reduces the possibility of misinterpretation, resulting in more accurate and efficient queries. Some common patterns include:

- **Consistent nomenclature**: Assign clear, descriptive names to model objects, such as tables, columns, primary and foreign keys. This helps to avoid confusion and ambiguity.

- **Capitalization conventions**: Use case consistently to differentiate object names. For example, use uppercase for table names and lowercase for column names.



- **Naming patterns**: Use consistent patterns for object names. For example, use the prefix "tbl" for tables and "fk" for foreign keys.

- **Formatting standards**: Use consistent patterns to format the template. For example, aligning objects vertically or horizontally.

- **Proper documentation**: Properly document the model with clear descriptions of the model objects, including tables, columns, primary and foreign keys.

3.2 NORMALIZATION

Normalization is an important process in data modeling that aims to improve the quality and efficiency of the database, it consists of applying a series of rules to eliminate redundancies and inconsistencies in the data, ensuring that each table contains only relevant information and that the relationships between the tables are clear and accurate, it has several normal forms, each with its own rules and goals. The first normal form (1FN) requires that each table have a unique primary key and that each column contain only atomic values, the second normal form (2FN) requires that each column depend completely on the primary key of the table, and the third normal form (3FN) requires that each column depend only on the primary key of the table, not on other columns. There are other normal forms, such as the fourth normal form (4FN) and the fifth normal form (5FN), but they are less common.

Normalization has several advantages, firstly, it helps to avoid unnecessary redundancies in the data, which can save storage space and improve database performance, secondly, it helps to ensure data integrity by avoiding inconsistencies and errors, thirdly, it makes it easier to add or modify data in the database without affecting other parts of the system.

However, normalization also has some disadvantages, firstly, it may be difficult to apply normalization rules correctly, especially in complex databases, secondly, it may be necessary to make multiple joins between tables to retrieve related information, which may affect database performance, and lastly, normalization may not be suitable for all use cases; In some cases, it may be more efficient to store redundant data to avoid excessive joins.

3.3 IDIDES AND PRIMARY KEYS

The standards recommend the use of indexes and primary keys to optimize the speed of data retrieval, indexes are structures that allow the quick location of records based on values of specific columns, while primary keys, ensure the uniqueness of each record in a table, speeding up the search and updating of data.

3.3 CONTROLLED STANDARDIZATION

Denormalization is the process of adding redundancy to a database to improve query performance and reduce the complexity of the data model, this is done by adding duplicate columns or helper tables that store information that already exists in other tables. Denormalization can be useful in situations where database performance is critical and redundancy does not impair data integrity, however, denormalization also has some disadvantages, firstly, it can lead to inconsistencies in the data if redundant information is not updated correctly, secondly, it can make the data model more complex and difficult to maintain, and thirdly, it can be difficult to determine when and where to apply normalization.

To minimize these problems, it is important to follow some best practices when applying denormalization:

- **Identify the most common** queries: Identify the queries that run most frequently and optimize the data model for those queries.
- **Add redundancy carefully**: Add only the information you need to improve query performance.
- **Maintain data integrity**: Ensure that redundant information is updated correctly when the underlying data changes.
- **Document properly**: Properly document the data model to make it easier for other team members to maintain and understand the model.

3.4 PARTITIONING AND ADVANCED INDEXING

Advanced indexing is a database optimization technique that allows you to improve the performance of queries against large tables, it is used to divide a large table into several smaller parts, called partitions, based on a specific criterion, such as the date or value of a column, this allows queries to run faster, because the database only needs to search the relevant partitions.

Advanced indexing is particularly useful in databases that need to handle large amounts of data, such as content management systems or big data analytics applications, and it can be used to improve the performance of queries against tables that are frequently updated.

Advanced indexing can be combined with other optimization techniques such as cluster indexing and bitmap indexing, clustered indexing involves physically organizing the data on the hard disk to minimize the number of reads required to retrieve the data, and bitmap indexing is a technique that uses bits to represent distinct values in a column and allows queries to run faster.

4 STANDARDS-RELATED RELIABILITY

Data reliability is a key factor for making assertive decisions. In this section, we will examine how adopting design patterns impacts the reliability of stored data. We will address issues such as referential integrity, consistency, and data validation. We will highlight how the correct implementation of standards reduces errors and avoids inconsistencies, increasing the reliability of the system as a whole.

It plays a crucial role in data modeling, directly influencing the credibility and usefulness of information systems. Strict implementation of design standards plays a vital role in ensuring the reliability of data. In this section, we will explore in depth how consistency in the application of standards contributes to system reliability, addressing notions of referential integrity, traceability, resilience to failure, protection of privacy, and data security.

Adriano Martins Antônio, in his article "Three fundamentals on information security that every professional needs to know", explores the foundations of information security that are essential for reliable practices in data modeling. In this article, Antônio highlights the importance of establishing solid standards to ensure the integrity and reliability of data (ANTONIO, 2017).

4.1 CONSISTENCY IN REFERENTIAL INTEGRITY AND DATA CONSISTENCY

Referential integrity is a crucial foundation for data reliability. By establishing links between tables through primary and foreign keys, design patterns ensure that connections between data remain uniform. For example, in a customer and order management system, referential integrity ensures that an order cannot be associated with a non-existent customer, preventing inconsistencies that could affect sales analysis and demand forecasts.

Antônio points out that referential integrity is one of the pillars of data reliability. Through the application of design patterns that establish relationships between tables through primary and foreign keys, it is possible to maintain coherent connections between the data, avoiding inconsistencies that could harm analysis and decision-making (ANTONIO, 2017).

Data consistency is also maintained through validation standards and constraints, which establish formatting and allowed values for specific fields. Consider an inventory management system where the quantity of products in stock should always be positive. By applying a validation pattern to this field, you ensure that invalid information, such as negative values, is prevented from being entered, avoiding misconceptions and problems resulting from incorrect data.

4.2 TRACEABILITY AND AUDITING

The traceability of the data is essential for reliability, allowing the reconstitution of the history of the changes made. Design patterns can involve creating audit logs that document every action in the

data, including the person responsible and the timing. This is particularly pertinent in regulatory and compliance contexts, such as the General Data Protection Law (LGPD), where it is necessary to document the handling of sensitive data.

The author also highlights the importance of traceability and auditing as a means of ensuring data reliability. Through the implementation of audit records that document the actions taken on the data, it is possible to identify and correct errors or manipulations, contributing to greater reliability and transparency (ANTONIO, 2017).

In addition, traceability provides an additional layer of reliability by making it possible to identify errors or malicious manipulations in the data. For example, if a discrepancy is detected between the recorded sales and the final financial figures, traceability allows you to identify exactly when and by whom the changes were made, assisting in the rectification and clarification of discrepancies.

4.3 RESILIENCE AND FAILURES AND RECOVERY

Data reliability is intrinsically linked to the system's ability to recover from failures. Design patterns can include sound backup, replication, and disaster recovery strategies. By defining standardized procedures for performing regular backups and maintaining replicas of data, it is ensured that in the event of hardware or software failure, information can be recovered without significant loss.

These standards are especially relevant in systems that operate in high-availability environments, such as financial services platforms. Imagine an online bank where a failure on the main server occurs. Continuous replication of data to a secondary server allows for an almost seamless transition for clients, ensuring reliable access and transactions.

4.4 SAFEGUARDING PRIVACY AND DATA SECURITY

The reliability of data is intrinsically associated with the security and privacy of the information stored. Design patterns include security mechanisms, such as encryption, that safeguard sensitive data from unauthorized access. For example, in an electronic medical records system, applying encryption ensures that patient information remains confidential even in the face of a security breach.

Authentication and access control are also critical to data reliability. Implementing strict authentication standards, such as the use of complex passwords and two-factor authentication, ensures that only authorized users can access the data. This reduces the risk of intrusions and security breaches while maintaining data integrity.

In addition, the author Antônio (2017) points out that data security is fundamental to the reliability of the system. The application of security standards, such as encryption and access control,

helps protect data from unauthorized access and privacy breaches while maintaining the integrity of information (ANTONIO, 2017).

Data reliability is a prerequisite for confident and well-informed decisions. Through the consistent adoption of design standards in data modeling, including maintaining referential integrity, implementing traceability, resilience to failure, and preserving data privacy and security, it is possible to create systems that inspire trust both internally and for external stakeholders. Rigorous application of these standards is a guarantee that the information handled remains accurate, consistent and reliable, laying a solid foundation for operational and strategic effectiveness.

5 GOOD PRACTICES IN DATA MODELING

When working on a complex project, it is relevant to consider the large amount of information that will be used during the process. This excessive volume results in the need to adopt good practices, which aim to facilitate and improve the organization of data. These conducts encompass both conceptual and practical stages.

As the project is developed, it becomes common to escape from the reality of the big picture. Therefore, it is necessary that there is good communication between software engineers and business analysts, so that the data model chosen is consistent with reality. For this to occur, it is necessary that both parties have full knowledge of the requirements of the company and seek to filter the data really needed, among all those available.

Filtering addresses complications from high volumes of data, which cause memory and performance issues. In many cases, only one section of data is able to resolve project backlogs without information overload. Therefore, selecting the most relevant data will maximize the operability of the database.

In addition, the relevance of choosing the data modeling technique should be emphasized. This choice should be based on the type of data you are working with. In each technique, there are specific benefits and harms. The key point is to figure out which data model offers the greatest benefits to your usage situation and where the downsides are mitigated.

After choosing the data model, make sure that it is designed so that it can be updated and modified with minimal difficulty. There will always be changes in the future, and it is important that the model has the flexibility to adapt to them. Taking this into consideration from the beginning will prevent future problems.

Finally, proper documentation of your data model is of paramount importance. With good documentation, other people will know what data is available and this will also make it easier to maintain and modify the data model in the future, where even new team members will be able to join

the team more quickly. After all, the current state of the data model will always be up to date through its documentation.

6 BALANCING BENEFITS AND CHALLENGES: THE IMPORTANCE OF SELECTIVE STANDARDIZATION IN DATA MODELING

Standardization within data modeling entails several benefits such as those cited throughout the article. However, we must be careful about what we should standardize, since data that come from heterogeneous, incomplete, unstructured or inconsistent sources should not be standardized.

As we delve deeper into environments where data comes from heterogeneous, incomplete, unstructured, or inconsistent sources, standardization can become a double-edged sword. Imposing patterns on heterogeneous data can result in loss of relevant information or even distortion of the original meanings. The rigid application of standards can also be impractical when the data is unstructured or incomplete since the lack of a predefined format makes it difficult to adapt to the imposed rules. That is, standardization becomes a challenge when the data is inconsistent. Forcing a uniformity in this sense can be harmful since the information from the original data can be of paramount importance.

Given this complex scenario, it is critical to take a selective approach to standardization. Careful evaluation of each dataset allows you to determine which elements can benefit from standardization and which need a more flexible approach. Selective standardization recognizes the importance of adapting to the reality of data and preventing distortion/editing of information, even if it means renouncing total uniformity.

7 METHODOLOGIES

7.1 SEARCH CLASSIFICATION

The research carried out in this article is exploratory and descriptive in nature. The goal is to analyze and discuss the importance of standardization in data modeling and its impact on the quality of database management systems. The research is conducted based on a comprehensive review of literature, theories, and concepts related to standardization, data modeling, and systems quality.

7.2 DATA COLLECTION PROCEDURE

The data for this research were collected through an extensive bibliographic survey. Reliable sources were used, including books, scholarly articles, and online resources from renowned experts and institutions in the field of data modeling, database management, and standardization. The information collected ranges from the importance of standardization in data modeling to the challenges faced when applying standards in environments with heterogeneous sources and complex data.

7.3 DATA ANALYSIS

Data analysis was performed through a qualitative approach, involving the critical interpretation of the information obtained. The data collected was organized into thematic categories, including the importance of design patterns in data modeling, the contribution of standards to the quality of database management systems, and the discussion of the challenges of standardization in complex scenarios.

7.4 INTERPRETATION OF RESULTS

From the data analysis, the results were interpreted in the light of the theories and concepts presented in the article. The main advantages of standardization in data modeling were identified, such as improving the quality of systems, referential integrity, data consistency and information security. In addition, the selective standardization approach was highlighted as a strategy to address the challenges related to heterogeneous sources and complex data.

8 CONCLUSIONS

In this article, we explore the importance of standardization in data modeling and its impact on the quality of database management systems, we begin with a contextualization on the need for standards and good practices in data modeling, highlighting the quote from Taiichi Ohno who highlights the importance of standards for continuous improvement, Through the application of design standards, it is possible to create more durable, efficient and reliable systems. In each section, we cover the different aspects related to standardization in data modeling, explore how standards contribute to the quality of systems, from the incorporation of principles to the application of practices such as normalization, advanced indexing, and controlled denormalization, each of these aspects plays a key role in optimizing performance, data consistency, and the ability to adapt to diverse scenarios.

Data reliability was a central point of discussion, where we looked at how design patterns contribute to referential integrity, data consistency, traceability, resilience to failure, privacy protection and data security, highlighting the need to follow rigorous standards to ensure data reliability at all stages of the lifecycle. However, we also recognize that standardization is not an absolute concept and can face challenges in environments with heterogeneous, incomplete, or inconsistent sources. We proposed the idea of selective standardization, where the application of standards must be carefully evaluated to avoid the loss of relevant information or the distortion of the original data. Selective standardization allows a balance between the search for uniformity and the need to preserve the integrity of information.

In short, standardization in data modeling is an essential element for building reliable and efficient systems. Through the judicious application of design standards and good practices, it is possible to create solid foundations for assertive decision-making and for the continued success of

companies and organizations. Selective standardization, when applied with discernment, can be the key to addressing the challenges that heterogeneous and complex data present, while preserving the reliability and usefulness of information.

REFERENCES

ANTONIO, Adriano Martins. Três fundamentos sobre segurança da informação que todo profissional precisa saber.

OLIVEIRA, R. A. (2012). Introdução a Bancos de Dados: Com Modelagem Dimensional. Cengage Learning.

SILVA, R. S. (2008). Bancos de Dados: Projeto e Implementação. Novatec Editora.

SOUZA, M. H. P., et al. (2014). Banco de Dados: Modelagem, Implementação e Práticas com MySQL. Elsevier Brasil.

TEIXEIRA, C. S. (2006). Bancos de Dados Relacionais: Teoria e Prática. Editora Campus.

https://www.devmedia.com.br/as-vantagens-do-uso-de-padronizacao-em-objetos-no-banco-de-dados/3221

https://www.devmedia.com.br/normalizacao-e-desnormalizacao-de-dados/24345

https://powerbi.microsoft.com/pt-br/what-is-data-modeling/

https://www.totvs.com/blog/negocios/modelagem-de-dados/

https://www.alura.com.br/artigos/normalizacao-banco-de-dados-estrutura

https://sarasanalytics.com/blog/data-modeling-best-practices/

https://revistas.ancib.org/index.php/tpbci/article/view/262/262

https://revistas.faa.edu.br/SaberDigital/article/view/1029/739

http://www.pmgacademy.com/pt/blog/artigos/tres-fundamentos-seguranca-da-informação

SEVEN
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The influence of infant death on the nurse's experience: Reflections in the light of phenomenology

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ABSTRACT

There are numerous positive and negative factors that influence the experience of nurses, especially those of a psychic and/or emotional nature, which can manifest themselves in various ways in the professional and even personal trajectory. To understand this experience in pediatric intensive care settings, appropriating the systematics involved in the relationship with children and families, it is necessary to reflect on the influence that infant death can have on this work. This study aimed to reflect on the influence of infant death on the experience of nurses, in the light of phenomenology. This is a qualitative study of the reflective essay type, with phenomenological inspiration, using aspects of the works of Merleau-Ponty, carried out from a dialogue between the scientific literature and the critical analysis of the authors. Each person experiences particular perceptions and sensations, including in the reality of intensive care settings. Professionals acquire special meanings in professional and personal life, because they are prepared for everyday situations of their work, and still have the opportunity to reflect on this world that surrounds them. The reflections demonstrated how the experiences with death infer values to the social role that the nurse routinely translates, considering her humanized attitude as a principle very well applied in reality, and how this set of her various perceptions and sensations have repercussions on the care provided.

Keywords: Child, nurse, death, perception, intensive care.

1 INTRODUCTION

The care experiences of the authors encouraged the construction of the study, based on the assumption that there are numerous positive and negative factors that influence the experience of nurses, especially those of a psychic and/or emotional nature, which can manifest themselves in various ways in the professional and even personal trajectory.

The professional category of Nursing is composed mostly of women, who are exposed to situations of physical and psychological exhaustion due to their performance in several different health scenarios, including hospitals [1].

In the hospital, the Pediatric Intensive Care Unit, for example, is the care sector for children and adolescents with severe conditions, usually life-threatening [2,3]. It is an environment where professionals are put in contact with suffering and death, providing physical, psychic and even social affectation, which demands from them some special attributes [3].

Among several other factors, the phenomenon of infant death is demonstrated as a generator of suffering at work, associated with the experience before the family, especially in prolonged cases due to the therapy used, often causing feelings of powerlessness and frustration of the team for not having been able to maintain life, although they are experienced and capable professionals [3,4].

It is clear that the psychic affectation can be present in the life of each and every health professional due to the situations inherent to their work, but there are also studies that demonstrate coping strategies, such as open conversation about working with their own colleagues, as well as family and friends outside the hospital, in order to discharge part of the anguish, sharing their experience. Nevertheless, in the situations that culminate with the successful treatment and cure of the sick child, these same professionals experience the feeling of accomplishment and happiness [5].

Thus, in order to understand the experience of nurses in pediatric intensive care settings, appropriating the systematics involved in the relationship with children and families, the following question was asked: what is the influence that infant death has on the nurse's experience? Thus, the objective was to reflect on the influence of infant death on the experience of nurses, in the light of phenomenology.

2 METHODOLOGIES

This is a qualitative study of the reflective essay type, with phenomenological inspiration, using aspects of the works of Merleau-Ponty, carried out from a dialogue between the scientific literature and the critical analysis of the authors.

According to Bicudo [6], an act of intuition and perception is shown by a phenomenon, being something that, individually, is shown to a subject in a contextualized way, which lives an experience. In phenomenological research, experience is that which manifests itself in a sensory way, which is not reduced only to memories and sensations, it is found in the depths of the being, that is, it is not only an experience in the world.

In the philosophical sense, phenomenology is configured as a way of reflecting, investigating and understanding the world, and not as a system of teachings, because this method seeks to

spontaneously contact the phenomenon from the immediate vision of the life of the being about his experience, without separating him from the object [7].

It is known that the professional category that remains in contact with the patient most of the time is nursing, so this study is directed to these professionals, with the intention of exposing the influences of the hospital routine in pediatric intensive care in the nurse's experience, especially with regard to the death of children under their care in this environment.

The phenomenological principles carry a mutual relationship with nursing, because there is a consensus between the two sciences regarding to consider the relationship of the human being and his world, therefore, phenomenology can be an option for the search for understanding the human experience in the most diverse contexts of care [8]. In this case, the experience between the professionals and their clients is highlighted.

However, in the phenomenological scenario, the systematization of the method is challenging due to the divergence of information and little consistency in the literature, which makes it difficult to operationalize [9].

In view of the above, for the reflection proposed, the study was based on a literature review, with analysis of texts extracted from books and electronic databases that portrayed aspects of the experience of nurses of pediatric services in the face of infant death, including journals and repositories in nursing and health.

3 DEVELOPMENTS

When reflecting on the term 'Phenomenology', we soon come to mind the study, analysis, investigation of a phenomenon, and before that the association with one or more events. But what phenomenon or event is it? For this occasion, reflections on infant death and its entire path, seen as an influencing phenomenon in the work of nurses.

Beforehand, it is recalled that phenomenology arises with the intention of accessing the pre-reflected world, the way the subject has his experience, that is, the innate experience, even before this subject takes it by consciousness. Therefore, it investigates the phenomenon that is the human experience itself as it was lived, without tying itself to thoughts or theories about the experience [10].

It is seen daily that only the announcement of hospitalization already causes fear on the part of the family of the sick child, given the unknown environment, which worsens when in the ICU, for example, due to the fear of the severity that the case may take. In this sense, the nurse stays a long time with the binomial and, sometimes, from the beginning is already part of and accompanies this complex path, which is permeated by many uncertainties, making the environment emotionally compromised for all who are there.

A study inspired by the ideas of the philosopher Merlau-Ponty, widely recognized for his phenomenological method, brings discourses of nurses in neonatology that expose the emergence of feelings such as fear, anguish and apprehension when dealing with a baby in intensive care, which was idealized by the family. However, they begin to minimize suffering by themselves in an intersubjective way, when they seek to understand this binomial in a painful moment [11].

In care practice, the nurse routinely perceives the need for this understanding of pain towards the client/family, starting from the idea that each human being will have their experience with the disease, treatment, including death in certain situations, and intentionally or unintentionally, gets involved with the phenomenon of hospitalization by putting themselves in the place of the other. That said, each person experiences particular perceptions and sensations.

Merleau-Ponty [12] expresses that the world is not what the being thinks, but what he lives; being open to the world, he will communicate directly with it, without possessing it, because it is infinite. We can bring this philosophical conception to the reality of intensive care settings, in which worlds and perceptions coexist, each with its own each.

Death is seen as an inevitable phenomenon, and carries a mixture of feelings such as fragility, incapacity and sadness, presenting itself as an even more difficult moment when it occurs in childhood, because it goes against the natural law of life, generating more intense suffering [13]. Discourses of professionals who care for children induce that, in the perspective of loss, in comparison with adults and the elderly, the child, as he has not yet had the opportunity to enjoy life, has his death worse assimilated by themselves [4].

Daily, in practice, one hears numerous reports similar to the above, raising the value of these lives when prematurely lost. Regardless of the factors associated with death, the monitoring of this phenomenon or even the news given by third parties when at other times and/or institutions, directly influences their work and that of other professionals.

In a study conducted in Brazil with nurses and physicians, the feelings and postures that confer the complexity of these experiences were exposed, addressing factors such as religious beliefs, lack of training and specific experience with the situation that particularize the way the professional deals with the phenomenon of infant death in intensive care [4].

For purposes of reflection, it is emphasized that this death said by the authors is not always expected, as in the case of clients with chronic conditions, for example, and may also come from acute conditions and even accidents, among others.

The phenomenon of infant death in an intensive care unit brings to light several implications that go beyond the immediate grief itself for the team. For the nurse, as care manager, before, during and after the event, it will still be necessary to deal with the other demands that do not end there, such as participation in the communication of bad news, the preparation of the body and its referral to an

appropriate place, organization of death documentation, among others. Usually, they can't even have their moment and space of suffering, since their assignments don't allow it.

Regarding the issue of professional training, it is seen that educational institutions hardly include in their curricula disciplines that address death and dying, and often the person will only face it in their own reality. It is recalled on this occasion, the first experiences with child loss as the psychic affectation was intensified by the unknown, and years later the confrontation of this type of situation has acquired new perceptions, without ceasing to be inhabited by empathic values.

Research indicates that the curative model, predominant in our area, can act as an obstacle to face this phenomenon, since the professional should be in charge of reversing the pathological condition, so it does not tend to include death as a perspective of their work [13].

We totally agree with the study by Silva et al. [13], when mentioning that there is subjectivity in our work, especially in the processes of loss, because each one has its own perspective, that is, sometimes the professional considers death as the best way out at the moment and even as the only option for the child.

According to reflections by Merleau-Ponty [12], the way in which the being is affected and the experience of a certain state of its own characterize the sensation. In the relationship with the pediatric patient there is a dichotomy, because sometimes the identification with him can increase the suffering of the professional, and sometimes it gives support, in view of the need for empathy to maximize the humanization of the conducts. In addition, for those professionals who are also fathers/mothers, the perception about infant death can be modified and influence coping [4].

Some professionals demonstrate that they live the patient's experience as much as the family itself, being able to take advantage of the opportunity, even if painful, as a way to mature and grow in the profession, since they perceive how vulnerable the family is during the whole process of death [14].

Merleau-Ponty [12] suggests that there is a strong personal involvement of the being with the world, in this way, science is seen by him as empirical, based on the human experience with the world in which they live. Thus, it is the world that offers meaning to human experiences.

There is coherence with the idea described above, considering that certain phenomena can hardly be defined and even investigated by common science, as in the case of infant death and its influence on the experience of nurses.

It is also necessary to direct reflections to the pleasure of the professional because he perceives his work in a pleasurable way when he sees himself satisfied in the exercise, becoming rewarding while he gets involved with the patient and family, obtaining success in the care provided. In this perspective, they acquire special meanings in their professional and personal lives, because in addition to being prepared for everyday situations of their work, they still have the opportunity to reflect on this world that surrounds them [3].

Nursing is universally recognized as a provider of care to sick people, and this process includes great solidarity and sensitivity to others, that is, in addition to considering the physical, it also involves the other aspects of the human being, which has distinguished it from other nearby categories. However, it is worth mentioning that the commitment of these feelings became an inherent value of the profession from the beginning, which does not diminish its technical-scientific capacity to the detriment of the others.

4 FINAL CONSIDERATIONS

The research allowed the authors to reflect on the phenomenon of infant death when investigating other studies on the subject, most with reports from the professionals themselves about this phenomenon that, notably, presents itself in a particular way for each person, how it is perceived and felt.

In addition, the reality of care directed not only to the sick child, but also to his family, was evidenced, encompassing all the load of feelings that the child loss causes in those who are involved in the care, including the nurses.

These reflections demonstrate how the experiences mentioned infer values to the social role that nurses routinely translate, considering their humanized attitude as a principle very well applied in practice, and how this set of their various perceptions and sensations have repercussions on the care provided.

The limitations of the study are the scarcity of research aimed at understanding the phenomenon of infant death in the perception of nurses, since most are focused mainly on the area of oncology and palliative care. Therefore, it is suggested investigations that consider the philosophical aspects of care in the other spheres.

REFERENCES

1. Silva MCN, Machado MH. Health and work system: challenges for the nursing in Brazil. Cien Saude Colet. 2020; 25(1):7-13.

2. Bazzan JS, Milbrath VM, Gabatz RIB, Cordeiro FR, Freitag VL, Schwartz E. The family's adaptation process to their child's hospitalization in an Intensive Care Unit. Rev Esc Enferm USP. 2020; 54:e03614.

3. Vasconcelos LS, Camponogara S, Dias GL, Bonfada MS, Beck CLC, Rodrigues IL. Prazer e sofrimento do trabalho de enfermagem em Unidade de Terapia Intensiva Pediátrica. Rev Min Enferm. 2019; 23:e-1165.

4. Nina RVAH, Lamy ZC, Garcia JBS, Álvares MEM, Cavalcante MCV, Nina VJS, Thomaz EBAF. As diversas faces da morte de crianças na perspectiva de médicos e enfermeiros. Medicina (Ribeirão Preto) 2021; 54(2):e-167273.

5. Barbosa IA, Barbosa KA, Silva CRS, Fonseca ADG, Paiva MM, Silva CSO. Aspectos emocionales de los profesionales de enfermería en atención oncológica pediátrica: narrativa fenomenológica. Cultura de los Cuidados. 2021; 25:(60): 6-18.

6. Bicudo MAV. Pesquisa qualitativa segundo a visão fenomenológica. São Paulo: Cortez; 2011.

7. Forghieri YC. Psicologia Fenomenológica: Fundamentos, Métodos e Pesquisas. São Paulo: Cengage Learning; 2010.

8. Souza MA, Cabeça LPF, Melo LL. Pesquisa em enfermagem sustentada no referencial fenomenológico de Martin Heidegger: subsídios para o cuidado. Av Enferm. 2018;36(2):230-237.

9. Nascimento YA, Filard AFR, Abath AJ, Silva LD, Ramalho-de-Oliveira D. The phenomenology of Merleau-Ponty in investigations about medication use: constructing a methodological cascade. Rev Esc Enferm USP. 2017; 51:e03296.

10. Pereira PS. Fenomenologia da prática: investigação em enfermagem da experiência vivida. Rev Enferm UFPE on line., Recife, 9(10):9608-15, out., 2015.

11. Refrande SM, Silva RMCRA, Pereira ER, Rocha RCNP, Melo SHS, Refrande NA, et al. Vivências do enfermeiro no cuidado ao recém-nascido de alto risco: estudo fenomenológico. Rev Bras Enferm. 2019; 72 (Suppl 3):111-7.

12. Merleau-Ponty, M. Fenomenologia da percepção. São Paulo: Martins Fontes; 2015.

13. Silva IN, Salim NR, Szylit R, Sampaio PSS, Ichikawa CRF, Santos MR. Conhecendo as práticas de cuidado da equipe de enfermagem em relação ao cuidado na situação de final de vida de recém-nascidos. Esc Anna Nery 2017; 21(4):e20160369.

14. Monteiro DT, Mendes JMR, Beck CLC. Percepções dos profissionais da saúde sobre a morte de pacientes. Revista Subjetividades. 2020; 20(1).

SEVEN publicações acadêmicas

Prenatal care of black women: Inequities and inequalities in the care of pregnant women

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ABSTRACT

Introduction: The National Policy of the Black Population as a strategy to face their demands regarding injuries is a reality, but it becomes precarious when it comes to equity and accessibility. It aims to minimize inequities, vulnerabilities in the field of health and needs related to color/ethnicity. Objective: to discuss the challenges caused by inequities and inequalities in the care of prenatal parturients of black women , and to analyze the role of nursing in the monitoring of prenatal care of black women. Methods: This is an integrative literature review study, based on scientific research platforms, such as: Latin American and Caribbean Literature on Health Sciences (LILACS), Nursing Database (BDEnf), Virtual Health Library (VHL) and Scientifc Electronic Library Online (SciELO). Results and Discussion: Many studies indicate that black women are the ones who most experience violence and structural inequalities, hindering their access to social and human rights, especially sexual reproductive rights. Final considerations: In this way, it is essential to strengthen the actions that aim to improve the health of black women, emphasizing integrality, the vision of a single individual, equity and ensuring accessibility in a broad way aiming at vulnerabilities.

Keywords: Prenatal care, Inequality, Black.

1 INTRODUCTION

Throughout history women were seen only as a reproductive body, who had no other needs to look out for. It was through public policies aimed at women's health that this context began to change. Much still needs to be done in relation to the health of black women, diversities and vulnerabilities such as low education, income, access to services, gender concerns, culture among other social determinants need to be taken into account when it comes to assistance to the female and black population (ASSIS, 2018).

Racial discrimination is defined as the active expression or behavior of racism and racial prejudice. The definitions of prejudice and racism are conceptions and reproductions that concern certain people or social groups placed in races predetermined by social groups. Racial discrimination is real and its representations are demonstrated through daily social practices and actions in the various sectors of society, generating situations of disadvantage and inequality among the population segments involved. It can manifest itself intentionally or not, either by insulting attributions, or even by the lack of obtaining access to public and constitutional goods, such as health, education, justice, housing, political participation, among others (CAMPOS, 2017).

The National Policy of the Black Population as a strategy to face their demands regarding injuries is a reality, but it becomes precarious when it comes to equity and accessibility. It aims to minimize inequities, vulnerabilities in the field of health and needs related to color/ethnicity. Therefore, these policies need to observe or add strategies that universally guarantee health promotion, guaranteeing their rights included in the SUS and in the policy aimed at this population.

The numerous racial and gender inequalities generate determinant barriers to the health and disease process of women, particularly black women. These barriers, often generated by institutionalized racism, prevent, or hinder the use and access of these women to health services, when compared to white women (NEVES, 2019). This study seeks to bring the challenges of inequities and inequalities in the prenatal care offered to black pregnant women, offering an analysis of what was improved from the implementation of public policies aimed at this reality with prenatal care.

The guiding question of this research is: are there divergences in the treatment between black and white women during prenatal care? The general objective of this study is to discuss the challenges caused by inequities and inequalities in the care of prenatal parturients of black women , and to analyze the role of nursing in the monitoring of prenatal care of black women.

2 METHODS

This is an integrative literature review study, based on scientific research platforms. For the literature survey, the electronic bibliographic scientific databases were consulted from March 2020 to November 2021, namely: Latin American and Caribbean Literature in Health Sciences (LILACS), Nursing Database (BDEnf), Virtual Health Library (VHL) and *Scientifc Electronic Library Online* (SciELO). Keywords and combined descriptors were selected, namely: Prenatal care; Health Inequality; Social Inequity; Racism; Discrimination based on Ethnicity; Racial Prejudice; Social Inequality, Primary Care.

After this search, the following inclusion criteria were applied: articles published in full, available electronically, in Portuguese, whose analysis of the references was based on the publications of the last 07 years (from 2013 to 2020), seeking to bring what has been addressed on the theme in

recent years, reaching a result of 43 articles, only those that privileged aspects related to theprenatal care of black women, or articles that addressed the inequities and inequalities in the care of black pregnant women.

We excluded from this research studies not pertinent to the theme, duplicate articles in the databases, theses, monographs and dissertations, in the form of handouts, letters and editorials, articles in English and Spanish, the full versions of the article and articles with the year of publication prior to 2013 were not available.

After this moment of identification, the following steps were performed: analysis of the material, through exploratory reading, followed by selective reading, as a way to select the articles related to the research theme. After new selection, through the interpretative reading in full of the articles, it was possible to obtain a final sample of 06 articles to be exposed in the table, of which they responded to the objective of this study and 20 articles for discussion of what was raised in the analysis of these articles.

For data collection, a concise form was used containing questions regarding the studies analyzed, regarding the main author, title, year of publication, objective, journal, type of research design, relevant results. After this stage, the analysis of the data obtained from the selected studies was carried out, being applied the Thematic Content Analysis, which is a research technique determined by the following methodological characteristics: objectivity, systematization and inference, using as a strategy the pre-analysis, exploration of the material and treatment of the results with their interpretation.

After the rereading of the articles, the collected data were analyzed systematically through the quotation, classification and final analysis of the articles, which were organized into two tables, aiming to capture the impact of the nursing consultation in the puerperium of women with postpartum depression.

3 RESULTS AND DISCUSSION

Many studies indicate that black women are the ones who most experience violence and structural inequalities, hindering their access to social and human rights, especially sexual reproductive rights. From an epidemiological analysis, race/color constitutes a determining factor for the living and health conditions of the black population in Brazil, it is worth mentioning that black women face ethnic-racial issues in an evident way in the indicators, revealing inequalities in access to health care and services (SOUSA, 2020).

The 06 selected productions are represented in table 01 and represent the sample synthesized according to the identification of the article, title, name of the authors, objective, method and year of publication.

Table 1- Summary of the articles included in the review according to the identification of the article, title, name of the authors, objective, method and year of publication in the period from 2013 to 2020.

Authors' names	Title	Goal	Method	Year
ASSIS, Jussara Francisca de.	Intersectionality, institutional racism, and human rights: obstetric violence comprehensions	Bring the concepts of intersectionality, institutional racism and human rights to understand obstetric violence related to black women in health.	This is a qualitative study	2018
LEAL, Maria do Carmo et al.	The color of pain: racial inequities in prenatal care and childbirth in Brazil.	To evaluate inequities in prenatal care and childbirth according to race/color using the pairing method based on propensity scores	Population-based study of national scope with interview and evaluation of medical records of 23,894 women in 2011/2012	2017
OLIVEIRA, Beatriz Muccini Costa; KUBIAK, Fabiana.	Institutional racism and black women's health: an analysis of Brazilian scientific production	To raise the Brazilian scientific production regarding institutional racism and the health of black women, in addition to analyzing how the theme has been treated by researchers	Literature review using systematic review methodology	2019
THEOPHILO, Rebecca Lucena; RATTNER, Daphne; PEREIRA, Éverton Luís.	Vulnerability of black women in prenatal care and childbirth in the SUS: analysis of the research of the Active Ombudsman	To analyze differences in prenatal care and childbirth in the SUS according to race/color based on data from the Stork Network Active Ombudsman Survey in 2012	A descriptive study used the secondary database of the SUS General Ombudsman's Office	2018
DE JESUS PEREIRA, Chirlene Oliveira; FERREIRA, Silvia Lúcia.	Experiences of quilombola women with reproductive planning and assistance in the pregnancy-puerperal period.	To analyze the experiences of quilombola women with reproductive planning and the assistance received by them in the pregnancy-puerperal period, in a rural community located in the recôncavo of Bahia.	Qualitative research with semi-structured interview	2016
BATISTA, Maria Amanda Lima.	Care inequalities under the ethnic-racial approach and their repercussions on women's health.	To analyze, based on scientific evidence, whether there is a distinction in the care provided by health professionals to women under the ethnic-racial approach.	This is an integrative review	2021

Source: Own elaboration, 2021.

Table 02 brings the main results and discussion pointed out in the studies on the factors related to the prenatal care of black women and the difficulties experienced by them during pregnancy, it is observed that there are multiple factors, as related to the nursing consultation nothing was mentioned.

Table 02- Summary of the results presented in the journals published between 2013 and 2020.

Author	Results and Discussion
ASSIS, Jussara Francisca de.	This article sought to bring to light the problem experienced by black and poor women in the puerperal pregnancy period in public health services. The implicit racial bias suggestive of institutional racism and sexism weave a network of complexities that has in the space of health units a dynamic full of conflicts.
LEAL, Maria do Carmo et al.	Compared to white women, black puerperal women had a higher risk of having inadequate prenatal care (OR = 1.6; CI 95%: 1.4-1.9), lack of attachment to maternity (OR = 1.2; CI 95%: 1.1-1.4), absence of a companion (OR = 1.7; CI 95%: 1.4-2.0), pilgrimage for childbirth (OR = 1.3; 95% CI: 1.2-1.5) and less local anesthesia for episiotomy (OR = 1.5 (95% CI: 1.1-2.1). Brown-skinned puerperal women also had a higher risk of having inadequate prenatal care (OR = 1.2; CI 95%: 1.1-1.4) and absence of a companion (OR = 1.4; CI 95%: 1.3-1.6) when compared to white women.
OLIVEIRA, Beatriz Muccini Costa; KUBIAK, Fabiana.	It was evidenced that the literature on the subject remains scarce, reinforcing the need to address the theme of racism in research. The debate about racism is of fundamental importance in its fight and that the association of racial inequality with the economic condition is a reflection of the myth of racial democracy that contributes to the maintenance of institutional racism.
THEOPHILO, Rebecca Lucena; RATTNER, Daphne; PEREIRA, Éverton Luís.	Black/brown women appear in worse conditions in socioeconomic characteristics, in prenatal care and childbirth, in all the variables studied, except for aggression in childbirth and supplementary payment. This knowledge about inequities and vulnerabilities should serve as a warning to society and to the public power as a guideline for the elaboration of policies and actions aimed at reducing inequalities in health.
DE JESUS PEREIRA, Chirlene Oliveira; FERREIRA, Silvia Lúcia.	The results reveal the precarious access and lack of knowledge about reproductive planning by quilombola women, as well as the lack of knowledge and difficulties of access to the monitoring of prenatal care, difficulties in performing childbirth and postpartum care.
BATISTA, Maria Amanda Lima.	Only two articles composed the study, demonstrating the scarcity of scientific productions dedicated to the theme of ethnic-racial inequality among women. The publications corroborate the results of other authors on the logic of care inequality among women according to the color/race criterion.

Source: Own elaboration, 2021.

The black woman needs a broader and more special look due to the sum of racism, racial discrimination, gender prejudice, the fact that she is a woman, black and are more susceptible to inequities, social inequalities, cultural and social determinants that provide the triggering of pathologies and especially with regard to health as a factor that builds obstacles to accessibility (DE JESUS PEREIRA, 2016).

Leal (2017) identified in her study results that pointed out racial disparities in the process of attention to pregnancy by black women and evidencing a gradient from worse to better care among black, brown and white women. For Oliveira (2019) it is necessary that there is a greater awareness of health professionals about the racism existing within health care services, so that it becomes indispensable to think about the racial category to obtain an egalitarian health as recommended by the Unified Health System.

Racism is fueled by ideas grounded in racial and social inequality, in the understanding that a white elite is privileged. This behavior led among other situations: physical, verbal and psychological aggressions based only on the understanding that blacks belong to an inferior race. Between the racist ideology behaviors arising from exclusion due to skin color and the ideal of whitening, the contempt

and institutionalized practices that deny the black population a quality care based on the policy that sustains it, brings grotesque and negative results for the social and cultural diversity of this population in access to the health network (FIGUEIRÓ, 2017).

Racism is based on social and racial differentiation due to the belief of higher or lower ethnicities. Based on the need to reduce owners and injuries to the health of the black population, the Ministry of Health launched the National Policy for the Black Population (PNSIPN), aiming at reducing ethnic-racial inequality (DA ROSA SILVA, 2019).

Racism is something extrinsic, it is learned from segregationist practices or ideas, which consequently generates the prejudice that it is a pre-judgment based on beliefs created or passed on, a judgment without basis, without scientific justification, characterized with irrational hatred and aversion to other races, a negative aspect susceptible to generalizations (LAGES, 2017).

Racial discrimination is the composite of racism and racial prejudice and consists of differentiation and unequal treatment. Both start from the thought and adoption of the position when believing or treating groups of races as inferior. These actions lead to discriminatory behaviors, generating unfavorable and disadvantageous situations for the individuals targeted by the discrimination. It manifests itself through gestures or offenses directed directly or indirectly with the broad objective of offending and belittling, either even by the denial of basic rights such as health, education, leisure, sports, housing, basic sanitation, participation in policies aimed at improving living conditions, among others (BIATO, 2019).

Institutional racism differs from racism, prejudice and racial discrimination, but it is based on the same essence and foundation. The institutional is characterized when a health professional is unaware of relevant facts about the health of the black population, denying him a care that contemplates their needs or when the health institution does not provide means and services to meet the needs of this population. The lack of knowledge of public policies leads to growth in inequality and inequities in the provision of care, whether continuous or momentary (DO NASCIMENTO, 2019).

Inequality in Brazil directly affects women, whether in the labor market, accessibility of information, access to health or violence. It is necessary to recognize the issues of gender, ethnicity, and economic power as factors of direct influence on the vulnerabilities of this public. This inferiorization contributes directly to the devaluation of their identities, culture, black female empowerment. It is necessary to recognize the existing policies aimed at reducing harm to this population (DAS NEVES PEREIRA, 2020).

The commitment to the fight to reduce institutional racism, discrimination in health units contributes directly to better efficiency in the care provided as well as in equity and quality of the same. The creation of this policy in an integral way is like a historical milestone for a population, which until then did not have its rights respected or prioritized (BATISTA, 2021).

The nursing professional during his training develops skills regarding the process of care for women during the gestational period, national laws and policies provide and legally support their practices, which thus enables the improvement in the quality of care and understanding of pregnant women both white and black. They are trained to offer through health education with educational lectures on the gestational process and its intercurrences in order to clarify what happens during this period from the first consultations and periodic examinations to implications that may occur during childbirth and puerperium, as well as the importance of humanized delivery and equity emphasizing the direction of care of black pregnant women (DE FREITAS OLIVEIRA, 2020).

It is the role of nursing during pregnancy to inform mothers about the importance of prenatal care, of the assiduous presence in the consultations, to emphasize the performance of the requested exams and updated vaccination booklet, to give support and attention to their complaints, clarifying their doubts and concerns, to promote health education lectures that aim to inform and solve doubts about the resulting pathologies, body changes, humanized delivery and the right to choose the type of delivery (MONTEIRO, 2020).

Primary Care is also responsible for offering follow-up during the puerperium, breastfeeding, care for the newborn and umbilical stump, alleviating with clear and objective information the fears arising from the process itself, taking into account the social determinants of each parturient, especially black women (DOS SANTOS, 2016).

Each pregnant woman brings with her concerns and concerns about pregnancy and that she does not always know how to expose, it is up to the nursing staff to welcome and identify each one of them, making sure that each complaint/doubt was heard and respected in its diversity. The prenatal care recommended by the Ministry of Health and humanization becomes effective when it respects the existing culture about the pregnancy and childbirth of each woman (PEREIRA, 2020).

It is expected an improvement in the care of black pregnant women with the insertion and knowledge of the national policy of the black population in the new model of care provided in the Family Health Strategy (FHS) with the integration of health professionals and community health agents. It's a slow and time-consuming process, but it needs to be practiced. The implementation and implementation of the health of this policy is a strategy that must count on the support of the state and municipal secretaries, being widely supported by the Ministry of Health (RUSCHI, 2018).

It is necessary to train health professionals for a significant improvement in the process of meeting the needs of the black population, in the transfer of information through informative education on the aspects that influence the process of pathologies. This would be the correct way to expand the guidelines of the Unified Health System (DA SILVA, 2021).

Primary Health Care is the gateway of users to the service, has an important role in the dissemination of policies that contemplate the population. Therefore, it becomes a favorable instrument

for the incorporation and promotion of the national policy of the black population policy based on the principles of the SUS in its entirety. However, the same policy needs to be implemented in several other areas of health care, such as secondary and tertiary units of the system (SILVA, 2019).

To be exercised in its entirety, it is necessary to unite all care networks. In hospital care, it is necessary to emphasize that in addition to care in its amplitude, in reduction of risks and pathologies as well as the expansion of access to health, it is necessary to respect the cultural differences and religious cults that are sometimes not accepted because they are religions of African origin both by patients and by health professionals. It is necessary a wide propagation of the rights to health among the black population, to make known pathologies, causes, treatments and early capture of the same, as well as the valorization of its culture.

4 CONCLUSION

The activities carried out in health programs still do not consider the specificities and demands of the health of the black population based on ethnic and racial characteristics and needs, which can lead directly to institutional racism, thus compromising the quality, efficiency and transparency in quality care aimed at minimizing the risks and injuries resulting from social determinants or pathologies associated with ethnicity.

Thus, it is essential to strengthen actions aimed at improving the health of black women, emphasizing integrality, the vision of a single individual, equity and ensuring accessibility in a broad way aiming at vulnerabilities. Discussing representativeness in councils, conferences and active participation in the demands of the SUS can be a beginning for the execution of the rights of the black population.

REFERENCES

BATISTA, L. E.; BARROS, S. Enfrentando o racismo nos serviços de saúde. Cadernos de saúde publica, v. 33, p. e00090516, 2017. Link: https://www.scielo.br/j/csp/a/8QtV5qv9LSRPCWytv45yspS/?lang=pt. Acesso em 17 de fevereiro de 2023.

CAMPOS, L. A. Racismo em três dimensões: uma abordagem realista-crítica. Revista Brasileira de Ciências Sociais, v. 32, n. 95, 2017. Link: https://www.scielo.br/j/rbcsoc/a/8YsCLH9MsCZ3dPWC47JLmFd/. Acesso em17 de fevereiro de 2023.

GOES, E. F.; NASCIMENTO, E. R. Mulheres negras e brancas e os níveis de acesso aos serviços preventivos de saúde: uma análise sobre as desigualdades. Saúde em Debate, v. 37, p. 571-579, 2013. Link: https://www.scielo.br/j/sdeb/a/kw9SwJT5SHMYty6dhTYvsGg/abstract/?lang=pt. Acesso em 12 de fevereiro de 2023.

LEAL, M.C., et al. A cor da dor: iniquidades raciais na atenção pré-natal e ao parto no Brasil. Cadernos de Saúde Pública, v. 33, p. e00078816, 2017. Link: https://www.scielo.br/j/csp/a/LybHbcHxdFbYsb6BDSQHb7H/?format=html&lang=pt. Acesso em17 de fevereiro de 2023.

NEVES, N.M.S.; LOPES, G.C. Reprodução, Partos, Maternidades e Paternidades: Perspectivas Contemporâneas em Antropologia e Saúde. Cadernos de Gênero e Diversidade, v. 5, n. 4, p. 3-11, 2019. Link: https://periodicos.ufba.br/index.php/cadgendiv/article/view/35580. Acesso em17 de fevereiro de 2023.

OLIVEIRA, B.M.C.; KUBIAK, F. Racismo institucional e a saúde da mulher negra: uma análise da produção científica brasileira. Saúde em Debate, v. 43, p. 939-948, 2019. Link: https://www.scielosp.org/article/sdeb/2019.v43n122/939-948/pt/. Acesso em17 de fevereiro de 2023.

SOUSA, A.S.; BAZZOLI, J.A.P. Segregação socioespacial: direito à cidade e mulheres negras. Revista Brasileira de Direito Urbanístico| RBDU, p. 251-264, 2020. Link: http://biblioteca.ibdu.org.br/index.php/direitourbanistico/article/view/2020silvasousa. Acesso em17 de fevereiro de 2023.

SIQUEIRA, S.A.V.; HOLLANDA, E.; MOTTA, J.I.J. Políticas de Promoção de Equidade em Saúde para grupos vulneráveis: o papel do Ministério da Saúde. Ciência & Saúde Coletiva, v. 22, p. 1397-1397, 2017. Link: https://www.scielo.br/j/csc/a/Hmkmtw9NYb5cVtfZwJqb36c/abstract/?lang=pt. Acesso em17 de fevereiro de 2023.

THEOPHILO, R.L.; RATTNER, D.; PEREIRA, É.L. Vulnerabilidade de mulheres negras na atenção ao pré-natal e ao parto no SUS: análise da pesquisa da Ouvidoria Ativa. Ciência & Saúde Coletiva, v. 23, p. 3505-3516, 2018. Link: https://www.scielo.br/j/csc/a/MsvQjnbsTvS3cSvvrqyyCCz/abstract/?lang=pt. Acesso em17 de fevereiro de 2023.

WERNECK, J. Racismo institucional e saúde da população negra. Saúde e Sociedade, v. 25, p. 535-549, 2016. Link: https://www.scielo.br/j/sausoc/a/bJdS7R46GV7PB3wV54qW7vm/abstract/?lang=pt. Acesso em17 de fevereiro de 2023.

FIGUEIRÓ, A.V.M.; RIBEIRO, R.L.R. Vivência do preconceito racial e de classe na doença falciforme. Saúde e Sociedade, v. 26, p. 88-99, 2017. Link: https://www.scielo.br/j/sausoc/a/5MxwBMXyqpfXk4BMsvW8nCf/abstract/?lang=pt. Acesso em17 de fevereiro de 2023.

LAGES, S.R.C., et al. O preconceito racial como determinante social da saúde-a invisibilidade da anemia falciforme. Gerais: Revista Interinstitucional de Psicologia, v. 10, n. 1, p. 109-122, 2017. Link: http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1983-82202017000100011. Acesso em17 de fevereiro de 2023.

BIATO, S.V.; DE OLIVEIRA, A.P.B. Racismo Institucional na Saúde. MOITARÁ-Revista do Serviço Social da UNIGRANRIO, v. 1, n. 3, p. 118-138, 2019. Link: https://www.scielo.br/j/sausoc/a/bJdS7R46GV7PB3wV54qW7vm/abstract/?lang=pt. Acesso em17 de fevereiro de 2023.

DO NASCIMENTO, S.S. Saúde da mulher negra brasileira: a necessária intersecção em raça, gênero e classe. Cadernos do CEAS: Revista crítica de humanidades, n. 243, p. 91-103, 2018. Link: https://periodicos.ucsal.br/index.php/cadernosdoceas/article/view/450. Acesso em17 de fevereiro de 2023.

DE JESUS PEREIRA, C.O.; FERREIRA, S.L. Experiências de mulheres quilombolas com planejamento reprodutivo e assistência no período gravídico-puerperal. Revista Feminismos, v. 4, n. 2/3, 2016. Link: https://periodicos.ufba.br/index.php/feminismos/article/view/30198. Acesso em17 de fevereiro de 2023.

DAS NEVES PEREIRA, R.; DE FREITAS MUSSI, R.F. Acesso e utilização dos serviços de saúde da população negra quilombola: uma análise bibliográfica. Odeere, v. 5, n. 10, p. 280-303, 2020. Link: https://dialnet.unirioja.es/servlet/articulo?codigo=7883161. Acesso em17 de fevereiro de 2023.

DA ROSA SILVA, T.F. Política social e democratização direito à saúde: equidade do acesso a mulheres negras a reprodução. Serviço Social em Debate, v. 2, n. 1, 2019. Link: https://revista.uemg.br/index.php/serv-soc-debate/article/view/3911. Acesso em17 de fevereiro de 2023.

BATISTA, M.A.L. Desigualdades assistenciais sob o enfoque étnico-racial e suas repercussões à saúde da mulher. Brazilian Journal of Health Review, v. 4, n. 2, p. 4922-4936, 2021. Link: https://ojs.brazilianjournals.com.br/ojs/index.php/BJHR/article/view/26003. Acesso em17 de fevereiro de 2023.

ASSIS, J.F. Intersectionality, institutional racism, and human rights: obstetric violence comprehensions. Serviço Social & Sociedade, n. 133, p. 547-565, 2018. Link: https://www.scielo.br/j/sssoc/a/JfVQpC8kyzshYtTxMVbL5VP/abstract/?lang=en. Acesso em17 de fevereiro de 2023.

DE FREITAS OLIVEIRA, A.D.; DE ALMEIDA CAMPELO, M.J. Pré-natal na zona rural, norte da Bahia-BA: Perfil de gestantes atendidas em consultas de enfermagem. Brazilian Journal of Health Review, v. 3, n. 5, p. 12439-12451, 2020. Link: https://ojs.brazilianjournals.com.br/ojs/index.php/BJHR/article/view/16656. Acesso em17 de fevereiro de 2023.

MONTEIRO, B.R., et al. Atenção à saúde no contexto do pré-natal e parto sob a perspectiva de puérperas. Revista Brasileira de Enfermagem, v. 73, n. 4, 2020. Link:

https://www.scielo.br/j/reben/a/HPDxkjGFYrHJcv4qwDQ3jjN/?lang=pt&format=html. Acesso em17 de fevereiro de 2023.

DOS SANTOS, A.F., et al. Conhecimento da gestante sobre a atuação do enfermeiro na assistência ao pré-natal na estratégia de saúde da família–esf. Revista Eletrônica Faculdade Montes Belos, v. 8, n. 4, 2016. Link: http://revista.fmb.edu.br/index.php/fmb/article/view/179. Acesso em17 de fevereiro de 2023.

PEREIRA, J.S., et al. Perfil de gestantes atendidas no pré-natal em equipes de estratégia saúde da família. Saúde Coletiva (Barueri), v. 10, n. 52, p. 2112-2123, 2020. Link: https://www.revistas.mpmcomunicacao.com.br/index.php/saudecoletiva/article/view/524. Acesso em17 de fevereiro de 2023.

RUSCHI, G.E.C., et al. Determinantes da qualidade do pré-natal na Atenção Básica: o papel do Apoio Matricial em Saúde da Mulher. Cadernos Saúde Coletiva, v. 26, n. 2, p. 131-139, 2018. Link: https://www.scielo.br/j/cadsc/a/FvR5qdVjtCmKYr7tzhjPfCw/abstract/?lang=pt. Acesso em17 de fevereiro de 2023.

DA SILVA, E.C., et al. Atuação do enfermeiro na prevenção das síndromes hipertensivas na gestação no âmbito da atenção básica. Revista Eletrônica Acervo Saúde, v. 13, n. 2, p. e6448-e6448, 2021. Link: https://acervomais.com.br/index.php/saude/article/view/6448. Acesso em17 de fevereiro de 2023.

SILVA, A.A., et al. Pré-natal da gestante de risco habitual: potencialidades e fragilidades. Revista de Enfermagem da UFSM, v. 9, p. 15, 2019. Link: https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1009364. Acesso em17 de fevereiro de 2023.

SEVEN publicações acadêmicas

Ventricular synchrony in artificial cardiac pacing: The role of the helical myocardium and fulcrum in the electromechanical coupling of the heart

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ABSTRACT

About 30% of patients with Heart Failure (HF) have wide QRS complexes. In left bundle branch block (LBBB), the electromechanical activation sequence in the Left Ventricle (LV) is asynchronous with deterioration of pump function, higher frequency of hospitalizations and mortality. Definitive artificial cardiac stimulation, especially when from the apex of the Right Ventricle (RV), entails ventricular activation identical and as antiphysiological as LBBB, and therefore, in a percentage of cases, a worsening of the degree of HF and a higher incidence of arrhythmias occurs. headphones, hospitalizations, and mortality.

In search of "physiological" stimulation, alternative RV electrode placement sites (non-apical sites) have been evaluated. We highlight the stimulation of the bundle of His, the area of the left branch, or biventricular stimulation for cardiac resynchronization, strategies included in a generic term: Cardiac Physiologic Pacing – CPP (1) and with promising results in preserving and/or restoring synchrony. cardiac electromechanics. However, due to the complexity of the procedures, especially technical and resources, the first two have not had the consensus or the expected growth. On the other hand, biventricular Cardiac Resynchronization Therapy (CRT) was also shown to be ineffective in about 30% of patients (non-responders).

Dr. Francisco Torrent Guasp, demonstrated that the ventricular myocardium is made up of a continuous muscular band with a helical shape, which explains the great efficiency of cardiac systole, where blood is expelled through torsion-detorsion contraction mechanisms, with a phase active suction in protodiastole. The cardiac fulcrum functions as a fulcrum and support for the helical myocardium. According to this author, the propagation of the electrical stimulus and the contraction of the myocardium (electromechanical coupling) begin in the region of the right ventricular outflow tract (RVOT) anatomically related to the cardiac fulcrum, advancing towards the rest of the helical myocardial segments and continuing the longitudinal direction of the muscle bundles, which could explain the results of definitive cardiac pacing in the RVOT septum with electrical synchrony in some cases.

Synchromax® (Exo S.A., Buenos Aires, Argentina) is a software which records non-invasively during lead implantation: spatial coincidence, area and direction of QRS in leads D2 and V6 from the ECG. Intraoperatively, after analysis and in real-time, generates a mathematical index called cross-correlation cardiac synchrony index (CSI) which at this time generates a couple of synchrony curves. A CSI value of 0.0 corresponds to maximum coincidence between both leads (perfect ventricular synchrony), 0.0-0.39 demonstrate adequate synchrony, 0.4-0.7 equal poor synchrony, and values > 0.71 correspond to cardiac dyssynchrony.

In this chapter we present a new perspective. An anatomical-mechano-physiological vision in which the coordination of cardiac activity is based on the interdependence between structure, activation and function: cardiac synchrony. In this context, physiological cardiac stimulation seeks to artificially reproduce that the result is, as in nature, maximum electromechanical coordination with the goal of the best cardiac systolic function. As will be explained, it is difficult to explain efficient and coordinated (synchronous) cardiac performance without an adequate structure, or to accept a non-complex anatomy for the competent development of the function.

Keywords: Ventricular synchrony, Artificial heart stimulation, The role of the helical myocardium.

1 INTRODUCTION

1.1 ASYNCHRONY IN VENTRICULAR CONTRACTION AS A DETERMINING FACTOR IN THE PATHOPHYSIOLOGY OF HEART FAILURE (HF)

About 30% of patients with HF have wide QRS complexes (>120 ms) (2). In left bundle branch block (LBBB), the activation sequence of the different LV walls is asynchronous, with a delay of the lateral in relation to the septum (3). This results in a decrease in effectiveness in ventricular systole, with deterioration of pump function, pre-systolic mitral insufficiency and increase in LV end-diastole pressure (4). Comparative studies in patients with HF showed a higher frequency of hospitalizations and higher mortality in those with wide QRS (figure 1) (5). These data are more evident in patients with genuine or true LBBB and QRS duration greater than 150 ms, while the results are not as notable or significant in patients with narrow QRS, right bundle branch block (RBBB) or nonspecific intraventricular conduction disorders (6, 7). However, these characteristics and the absence of eventual response to cardiac resynchronization therapy (CRT) do not mean that there is no cardiac asynchrony in these patients, but perhaps they are translating into a lack of scope of the implemented strategies.

Figure 1: Graph of year mortality in patients with heart failure with and without left bundle branch block.

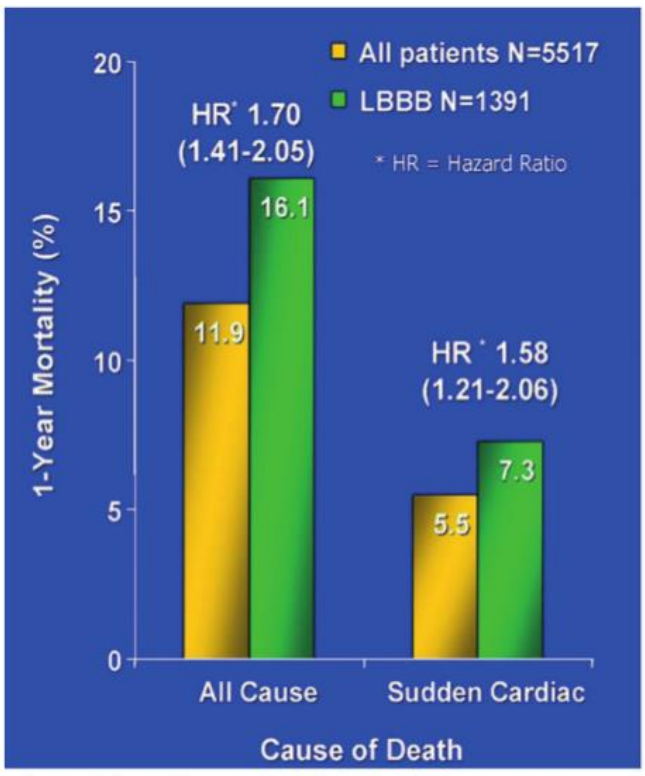


Figura 1
Gráfico de mortalidad al año en pacientes con Insuficiencia Cardíaca con y sin bloqueo de rama izquierda.

2 DEFINITIVE APEX STIMULATION AS A CAUSE OF LEFT VENTRICULAR DYSSYNCHRONY

The first pacemaker implantation was performed in 1958 by Dr. Ake Senning at Karolinska Hospital, (Stockholm, Sweden). Those first pacemakers were implanted with electrodes in the epicardium, later evolving over time to endocardial implantation, transvenously, traditionally with definitive positioning of the electrode in the apex of the right ventricle (RV). The results of definitive cardiac stimulation managed to improve the survival of patients with severe symptomatic bradyarrhythmias and today it is the undisputed treatment when any pathology in this scenario is irreversible. However, a percentage of them (difficult to predict in advance) will present deterioration in LV function, worsening of the degree of HF and a higher incidence of atrial arrhythmias (figure 2)(8). The explanation for such an undesirable effect is that by stimulating the RV apex we would be producing an "iatrogenic" LBBB, since ventricular activation is identical and as antiphysiological as in said conduction disorder. In this way, a new entity arises that we can call cardiomyopathy induced by artificial dyssynchrony (MIDA). (9, 10)

Figure 2: This review paper shows the deleterious effect of definitive pacing in the RV apex, which may lead to deterioration of LV function, worsening of HF and increased incidence of atrial fibrillation.

The Deleterious Consequences of Right Venricular Apical Pacing

ANTONIS S. MANOLIS REVIEW PACE 2006: 298-315

Trial	No. of Patients	Mean Age (y)	Mean FU (y)	LA Diameter	LV Function	CHF	AF
Tantengco et al.[28]	24	19.5	9.5	NA	↓	2 pts	NA
Karpawich et al.[29]	14	15.5	5.5	NA	Altered Histology	NA	NA
Thambo et al.[30]	23	24	10	NA	↓/DS	NA	NA
Tse et al.[31]	12	72	1.5	NA	↓/MPD	NA	NA
Hamdan et al.[32]	13	66	NA*	NA	↓/↑SNA	NA	NA
DAVID[36]	506	64	1	NA	NA	↑	NA
MADIT II[37,38] Substudy	567	64	1.7	NA	NA	↑	NA
Wonisch et al.[39]	17	59	0.25	NA	NA	**	NA
Thackray et al.[40]	307	72	5.2	NA	NA	↑	↑
MOST[41]	1,339	74	6	NA	NA	↑	↑
Nielsen et al.[43]	177	74	2.9	↑	↓	NA	↑
O'Keefe et al.[44]	59	69	1.5	NA	↓	NA	NA

Figura 2
En este trabajo de revisión se evidencia el efecto deletéreo de la estimulación definitiva en el ápex del VD, la cual puede producir deterioro de la función VI, empeoramiento de la IC y aumentar la incidencia de fibrilación auricular.

Given the demonstration with multiple scientific evidence of the existence of MIDA, algorithms were implemented to minimize ventricular stimulation, being in a way a contradiction, since a pacemaker is implanted with the purpose of artificially activating the heart for the shortest possible time. , especially in those patients who do not depend on artificial ventricular stimulation. On

the other hand, paradoxically, the action of these algorithms triggers atrio-ventricular intervals (PR interval in the surface ECG), often very long, also anti-physiological and capable of triggering dyssynchrony in the same way, only this time between atria and ventricles. (atrioventricular - AV dyssynchrony) (11, 12). That scenario: avoiding wide QRS – artificial LBBB and its consequences vs. Maintaining narrow QRS causing AV dyssynchrony due to long PRs that are also antiphysiological, poses the challenge of finding alternative forms and sites of stimulation in order to avoid this dyssynchrony and MIDA. It also confronts us with the alternative need to have a real-time diagnosis of cardiac electromechanical coordination (synchrony), which helps us during the intraoperative period to have a better notion of the effect generated by the artificial stimulation by the electrode from that specific site.

3 CARDIAC RESYNCHRONIZATION THERAPY (CRT) AS A TREATMENT FOR HF

In order to correct intra- and interventricular dyssynchrony, the use of CRT by biventricular artificial stimulation began to be implemented. Since the first publication of CRT implantation by Serge Cazeau in 1994, several multicenter studies demonstrated the effectiveness of CRT in improving the morbidity and mortality of dilated patients, with grade III-IV HF, systolic failure with EF <35%. and BCRI (Figure 3A) (13, 14). However, CRT is ineffective in about 30% of patients, classified as "Non-Responders" (Figure 3B) (15, 16). Among the reasons for this lack of adequate response we can mention the technical difficulties in catheterizing the coronary sinus, many of them due to unpredictable anatomy, failure to stimulate or position the cable - electrode in a vein on the lateral aspect of the LV (the most delayed due to LBBB), diaphragmatic stimulation, high thresholds, etc. (17–19).

Figure 3: A) Effect of CRT on morbidity and mortality in patients with HF (CARE-HF Trial Cardiac Resynchronization-Heart Failure). B) Percentage of patients not responding to CRT and its causes.

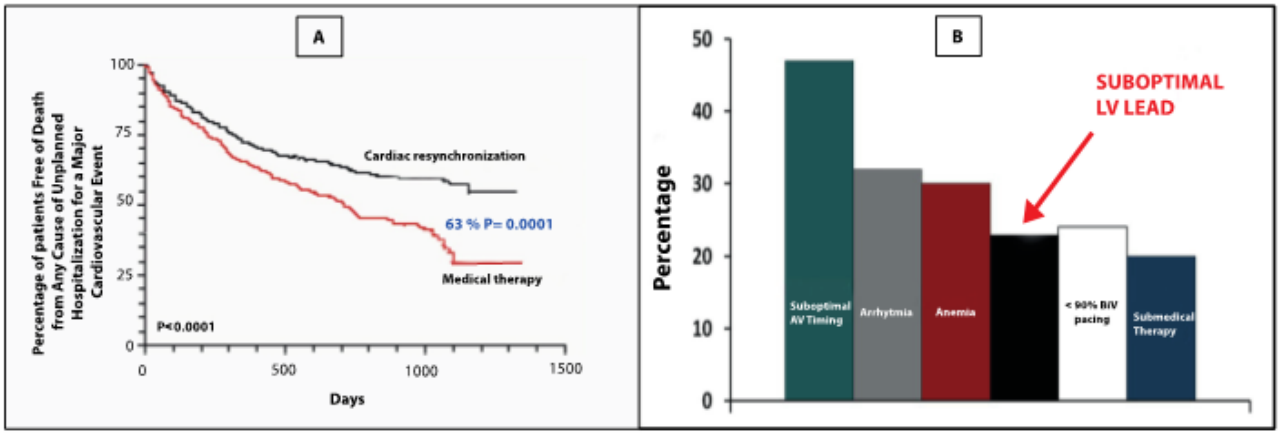


Figura 3: A) Efecto de la TRC sobre la morbi-mortalidad en pacientes con IC (CARE-HF Trial Cardiac Resyncronization-Heart Failure). B) Porcentaje de pacientes no respondedores a la TRC y sus causas.

4 THE ROLE OF CONDUCTION SYSTEM PACING AND ALTERNATIVE VENTRICULAR PACING SITES IN PREVENTING DYSSYNCHRONY

The alternative non-apical RV ECA sites have the purpose of achieving a more coordinated and close ventricular electromechanical sequence than the natural one due to the intrinsic conduction system. It is understood that this will result, therefore, in obtaining better, almost physiological activation (cardiac synchrony) (20). Non-selective or selective capture of the His bundle proved to be superior to RCT of the RV apex, especially in those patients with a pacing load greater than 20-40% and a LV ejection fraction less than 50% (Figure 4) (21, 22). However, these procedures require a long learning curve due to their technical difficulties, are complex and high cost due to the use of special materials, have a higher risk of complications and reinterventions, higher capture thresholds, shorter battery life, and doubts about their long-term safety, as a consequence they have not had the expected consensus or growth (23). Furthermore, to carry out these procedures it is necessary to have a polygraph and the presence of a specialist in invasive electrophysiology trained in intracavitary mapping, which is presented as a limitation, since we must keep in mind that, in most countries, Cardiac pacing devices are generally implanted by cardiovascular surgeons.

Figure 4: Mortality and HF hospitalizations are higher in patients with LBBB-when LV ejection fraction is less than 50%.

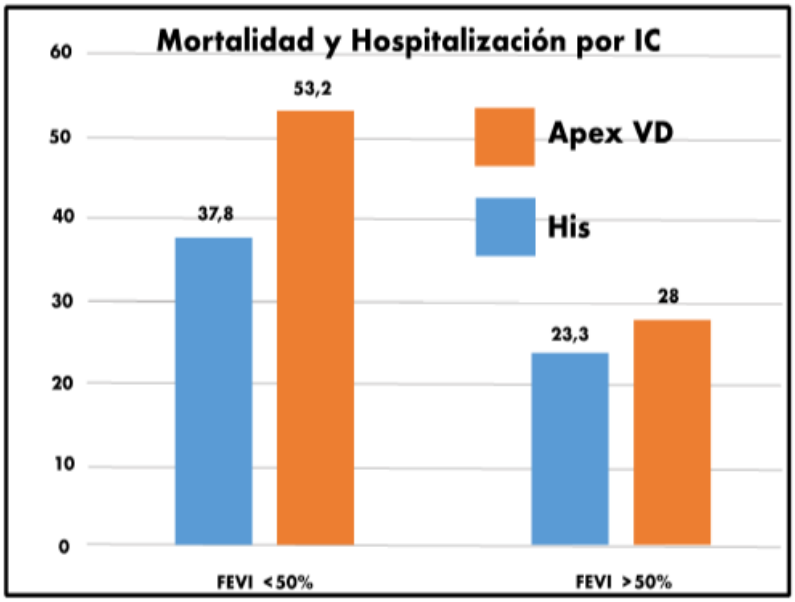


Figura 4: La mortalidad y hospitalizaciones por IC es mayor en pacientes con BCRI cuando la fracción de eyección del VI es menor de 50%.

On the other hand, the stimulation of the tissues of the His area (parahisian or His Area Pacing - HAP) and the left branch (Left Bundle Branch Area Pacing - LBBAP) were shown to be non-inferior to that of the non-selective His, and are gaining place progressively as more experience is acquired and technical resources improve (24, 25). The concept of physiological cardiac stimulation must

always be considered before implanting a device, even in patients with a normal heart and a narrow QRS, because it is important to avoid the damage that we can generate in a patient without dyssynchrony, solving the electrical problem at the cost of a mechanical problem for the heart (cardiomyopathy induced by artificial dyssynchrony – MIDA).

5 FULCRUM AND TORSION OF THE HELICAL MYOCARDIUM. NEW PARADIGMS IN THE CONCEPTION OF THE ANATOMICAL-FUNCTIONAL PHYSIOLOGY OF VENTRICULAR CONTRACTION

The Danish anatomist Nicolaus Steno, in 1663, established for the first time the muscular nature of the heart ("Cor vero musculus est"). Since then, future generations of researchers strove to understand how the architectural structure of the ventricular myocardium explained the relationship between ventricular form and function. The overall arrangement of the ventricular muscle was 'easy to observe and difficult to understand'. The muscle fibers of the ventricular walls presented a pronounced global and local anisotropy, with electrical and mechanical properties that varied in time and were spatially inhomogeneous, constituting a true "Gordian knot" of the functional anatomy of the heart, which persisted for almost five centuries.

The Spanish doctor and scientist Dr. Francisco Torrent Guasp, through multiple dissections in human hearts and other species, demonstrated that the ventricular myocardium is made up of a set of muscle fibers twisted on themselves resembling a laterally flattened rope like a double-turned band, like a figure-eight helicoid (figure 5) (26). Torrent Guasp's theory of heart function is based on the grouping of the muscle fibers that make up the ventricular myocardium in a continuous band that is wound into a double helix. In this way, physiologically, the organization of the myocardium in a band with two helicoids greatly facilitates the understanding of cardiac mechanics and its effectiveness in generating the cardiac cycle: torsion – detorsion, pressure and ejection (27).

The Torrent Guasp Helical Ventricular Myocardial Band (BMVH) is a revolutionary concept in the understanding of the global three-dimensional functional architecture of the ventricular myocardium, and defines the integration between tissue form and function, where the ventricles are located both anatomically and functionally. well coupled, so that 'two hearts can beat as one'.

The Argentine heart surgeon Dr. Jorge Trainini continued and advanced the studies of this mechanistic and biophysical theory, and through deep, thorough and exhaustive research work, he managed to reinforce these concepts and expand them until achieving an understanding of the functional anatomy of the heart, conceiving revolutionary contributions, such as: Protodiastolic suction as an active process, the cardiac fulcrum as support for the contractile muscle and hyaluronic acid as a lubricant in the antifriction mechanism (28).

Figure 5: Location of the cardiac fibers in the continuous myocardium (chordal model). The right angle shows the three-dimensional arrangement of the continuous myocardium).

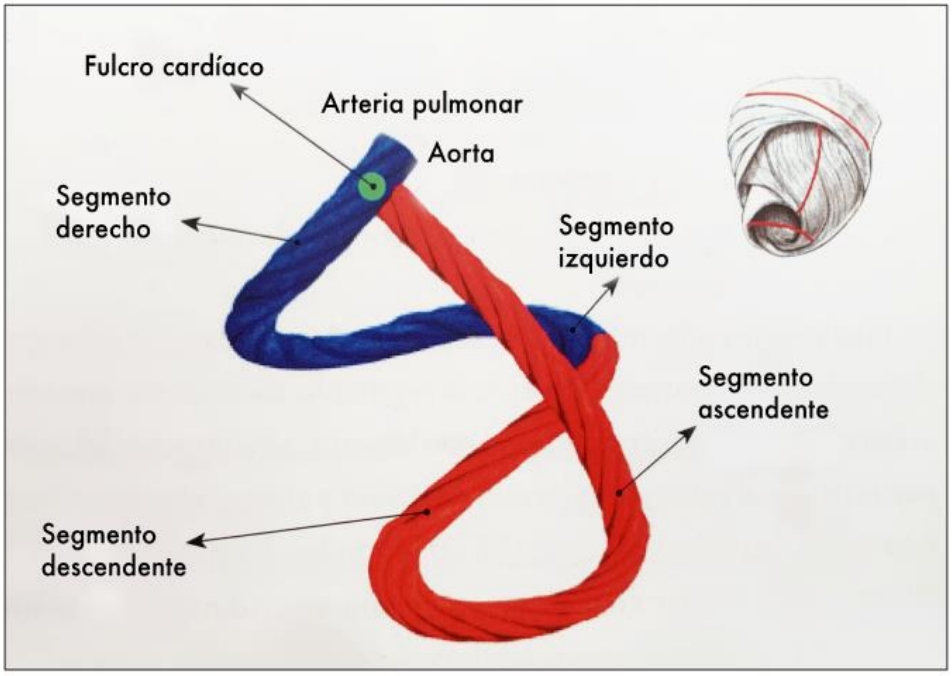


Figura 5: Ubicación del fulcro cardíaco en el miocardio continuo (modelo de la cuerda). En el ángulo derecho se muestra la disposición tridimensional del miocardio continuo).

5.1 DISSECTION METHOD AND PARTS THAT MAKE UP THE HELICAL MYOCARDIUM

The anatomical dissection is carried out with a standardized methodology, progressively advancing on defined muscular planes, with the purpose of unwinding the helical structure, which favors the successive and concatenated physiological movements of contraction and relaxation (torsion-detorsion), dependent on the propagation of the electrical stimulation through its muscular pathways. It is not the purpose of this chapter to make a detailed description of the dissection method; there are multiple publications that describe it, as well as videos on the internet and books published by Dr. Trainini (28).

Meanwhile, briefly and for educational purposes, the heart is previously prepared by boiling a mixture of water and acetic acid. The dissection maneuver carried out with the hands, without the need for any instruments, begins by applying pressure with the fingers on the anterior interventricular groove, through which it is possible to detach or separate the free wall of the RV, which is on the left side of the operator (figure 6A).

Next, the cardiac muscle is uncoiled through digital traction and pressure maneuvers that follow the direction of the muscle fibers, until it becomes a continuous band rolled up in a figure of eight, where two loops can be identified:

The Basal Loop has two segments: The Right Segment begins in the pulmonary artery including the outflow tract and the free wall of the right ventricle, contours on the outside of the orifice of the

tricuspid valve, to continue behind with the Left Segment located in the wall. free of the left ventricle outside the orifice of the mitral valve.

Apexian Loop: It in turn has two parts, the Descending Segment in continuity with the left segment of the basal loop, descends obliquely, from the lateral wall of the VI towards the septum, and then retracts and rotates at the apex forward and above. From there, it takes the name of Ascending Segment, which runs in a more external position (subepicardial) and in a vertical direction, ascending in front and superimposed on the descending segment, to end below the base of the aorta in a structure in the that bind the fibers, the cardiac fulcrum.

5.2 CARDIAC FULCRUM

Todo músculo, por naturaleza, requiere un punto de apoyo o palanca para cumplir su función de contraction and relaxation, as evident in skeletal muscle. It is difficult to explain how, physiologically, the muscular segments that make up the ventricular cavities, in the thoracic cavity, free of all support, can develop a pressure of 120 mmHg in a few thousandths of a second and push 4 to 6 liters/minute of blood at a speed of 300 cm/s.

In his multiple dissections and investigations in human hearts and other species, Dr. Jorge Trainini discovered and described an osteo-chondroid-tendinous nucleus which he called Cardiac Fulcrum (29), describing its anatomical location and its histological and functional. This structure is located below and in front of the aortic root near the origin of the right coronary artery, in front and to the left of the tricuspid annulus and behind and to the right of the pulmonary valve (figure 6B). The cardiac fulcrum represents a meeting point where both ends of the helical myocardium are inserted “like ivy to a stone”: Its initial end (the right segment of the basal loop) is tied to the anterior face of the fulcrum; Its final section (the ascending segment of the apex loop) is inserted into the fulcrum at the bottom and in a deeper plane than the initial end.

The fulcrum as an anatomical structure had been previously described in animals, especially in dissections of bovine, ovine and porcine hearts, identified as having a bony consistency and called “os cordis”, however it was never assigned any function (30). Dr. Trainini's studies identified it in human hearts, confirming its existence not only in dissections, but also in computed tomography and nuclear magnetic resonance studies, and also defining its function as a fulcrum and support of the helical myocardium, explaining and resolving the physiological relationship between structure and function.

Figure 6: A) Dissection of a bovine heart. The Helicoidal Muscular Band can be observed unfolded (own experience). B) Image where the cardiac fulcrum and the different segments of the helical muscular band can be appreciated.

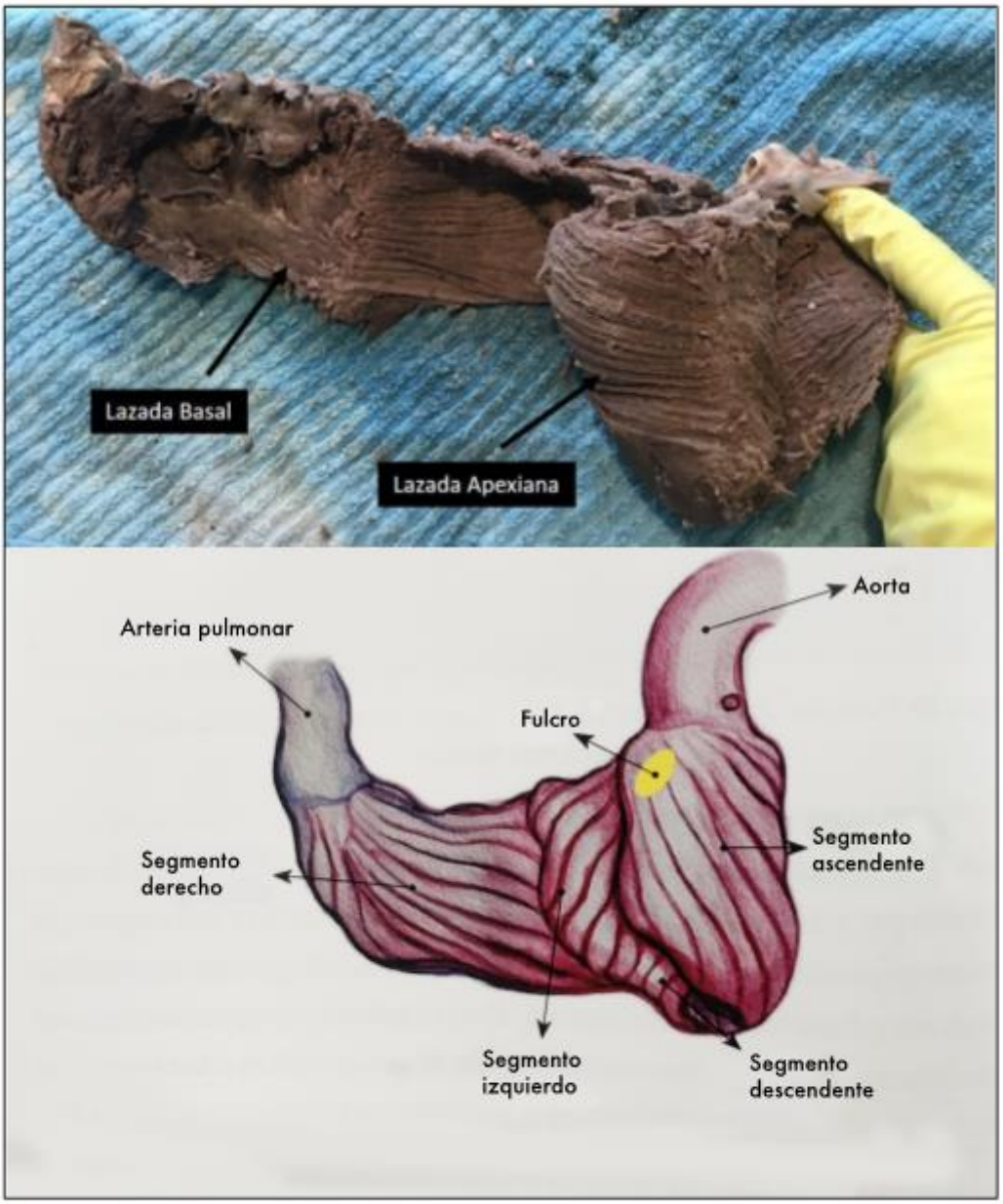


Figura 6: A) Disección de un corazón bovino. Se puede observar la Banda Muscular Helicoidal desplegada (experiencia propia). B) Imagen esquemática donde se puede apreciar el Fulcro Cardíaco y los diferentes segmentos de la banda muscular helicoidal.

5.3 CONTRACTION, TORSION-DETORSION, SUCTION PUMP FUNCTIONS (PROTODIASTOLE)

The heart is a pump that expels 70% of the left ventricular content with only 12% shortening in its contractile unit (the sarcomere), with great mechanical efficiency, that is, the work/energy ratio, superior to most of the pumps. machines (50% vs 30%). This function could not be justified with only the radial shortening during systole, described in classical physiology texts. The myocardial continuity in the form of a helix supported at both ends on the fulcrum allows us to explain a structure-function relationship. Through torsion-detorsion mechanisms, during contraction, the muscle mass is “squeezed like a towel” shortening in its three radii, longitudinal, circumferential and radial. The tip of the heart

is fixed in its position, while the base descends like a piston, shortening the longitudinal diameter, while an opposite rotation movement of the muscle fibers occurs, clockwise in the apex part and in opposite direction at the base.

In the most initial phase of diastole (protodiastole), contrary to the traditional concept, there would not be isovolumetric relaxation, but rather an active suction phase. During the first 100 ms of diastole, due to the contraction of the vertical ascending segment of the apex loop, the longitudinal diameter of the LV increases, with the aortic and mitral valves closed, generating negative intraventricular pressure with energy expenditure (figure 7). This sudden lengthening of the base-apex distance of the left ventricle, after the ejection phase, produces a suction effect through an action similar to that of a "suction cup", configuring a dynamic in three stages (systole, suction and diastole) (28).

Figure 7: Diagram showing the phases of the cardiac cycle, with particular attention to the protodiastolic active suction phase, where there is widening of the LV longitudinal diameter with closed valves, with consequent drop in intraventricular pressure, which generates an aspiration mechanism.

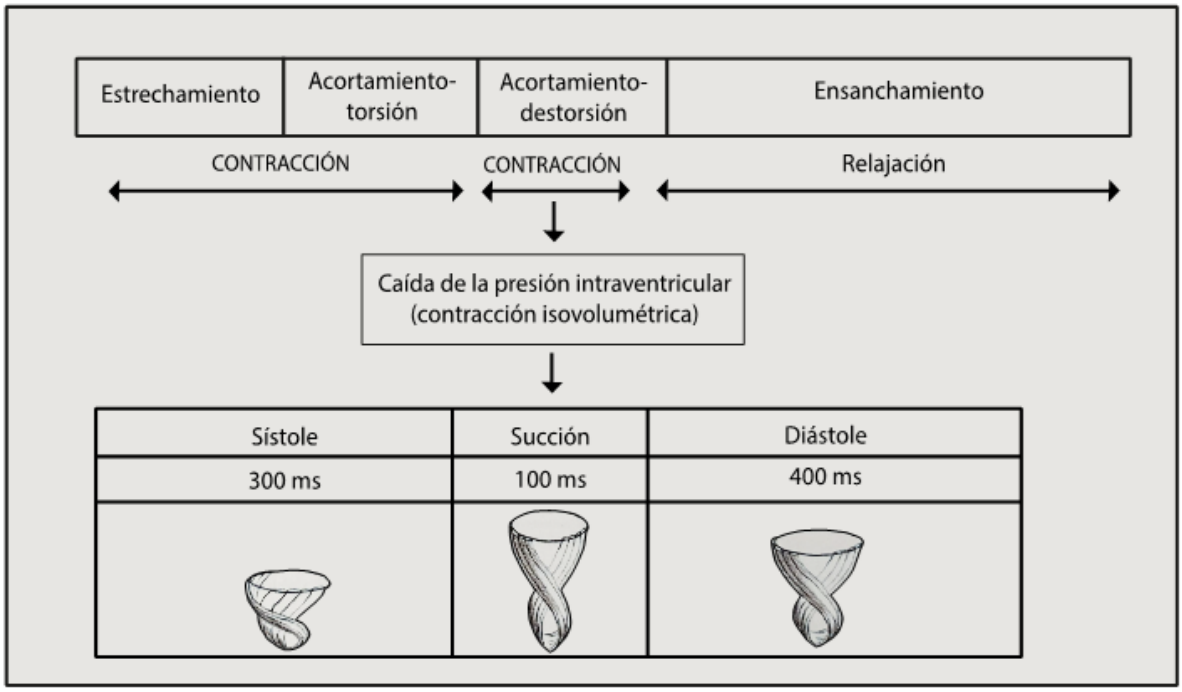


Figura 7: Esquema que muestra las fases del ciclo cardíaco, prestando especial atención a la fase de succión activa protodiastólica, donde hay alargamiento del diámetro longitudinal del VI con válvulas cerradas, con la consiguiente caída de la presión intraventricular, lo cual genera un mecanismo aspirativo.

5.4 FRICTION BETWEEN ASCENDING AND DESCENDING SEGMENTS, HYALURONIC ACID

During ventricular torsion-detorsion movements, sliding and friction in the opposite direction occurs between the descending and ascending segments of the apex loop, which are superimposed and perform an opposite movement during contraction, due to the direction of their fibers. . This implies that there should be an anti-friction mechanism that facilitates the sliding of the muscle bundles. Small

venous conduits that originate from the intramyocardial veins (Thebesius) or the tributary veins of the greater coronary vein (Langer), cross the myocardium and drain into the cardiac chambers, and provide hyaluronic acid, which would function as "lubricating oil." organic (31).

5.5 ELECTRICAL ACTIVATION AND MECHANICAL FUNCTION

Using three-dimensional electro-anatomical mapping techniques with a 3D navigation system, it was evident that both the propagation of the electrical stimulus and the contraction of the myocardium begins in the RVOT region anatomically related to the cardiac fulcrum, advancing towards the basal loop, and to its time activating the muscle bundles of the descending and ascending segments of the apex loop, following the longitudinal direction of the muscle bundles towards the apex and finally ending in the ascending segment near the aortic annulus (figure 8). This electrical activation sequence is what allows and enables the torsion-detorsion mechanisms during myocardial contraction (32).

Figure 8: Schematic image of the helical myocardium represented by the asplaned chordae. The activation/contraction sequence is observed. In red the earliest and in blue the latest.

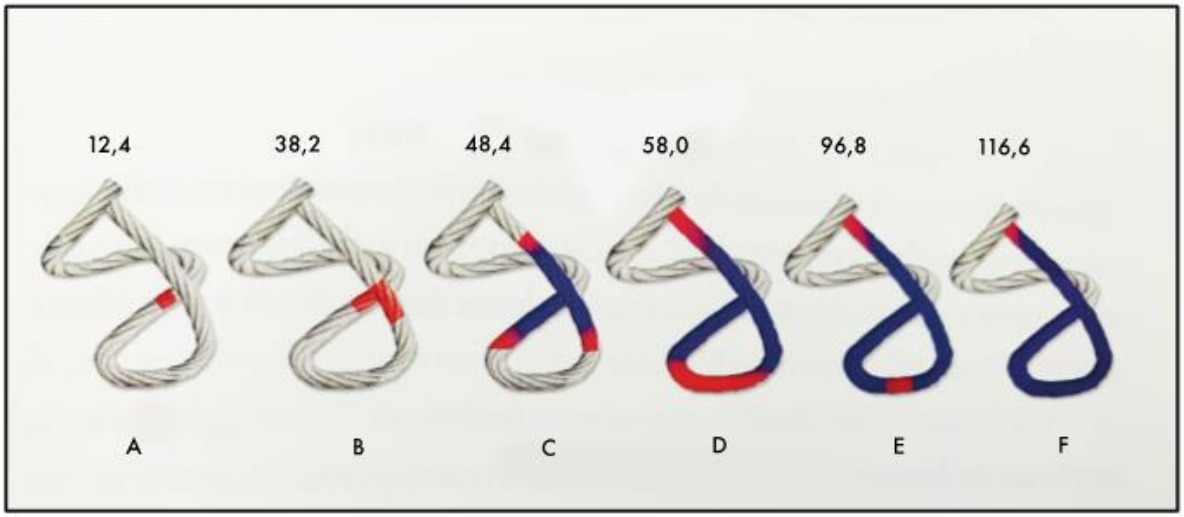


Figura 8: Imagen esquemática del miocardio helicoidal representado por la cuerda aplanada. Se observa la secuencia de activación/contracción. En rojo lo más precoz y en azul lo más tardío.

The direction and spatial sense of the contraction motivated by electrical activation from a physiological site and based on the architecture of the band itself, determine the effectiveness of the work (synchronous coordination) (27). Affecting the propagation of the electrical stimulus alters the contraction synchrony, and therefore the torsion-detorsion mechanisms, as can be observed in patients with LBBB and some with definitive stimulation in the RV apex. Studies are underway to analyze the hypothesis that heart failure with preserved ejection fraction could be caused by failures in the protodiastolic suction mechanism.

5.6 RESEARCH METHODS AND CLINICAL STUDIES ON HELICAL MYOCARDIUM

Images obtained with cardiac magnetic resonance by diffusion tensor (27), echocardiographic analysis with the speckle tracking technique, electrophysiological studies with three-dimensional electro-anatomical mapping techniques and laboratory investigations were procedures used in the extensive studies carried out by the Dr. Trainini's team and categorically support his claims. The dizzying changes in the advancement of cardiac imaging techniques will surely enable a better understanding of the three-dimensional myocardial structure and its function.

6 DEFINITIVE STIMULATION OF THE RVOT GUIDED BY ELECTRICAL SYNCHRONY IN REAL TIME

Physiological artificial cardiac stimulation (ACE) means and translates the capture of the patient's intrinsic conduction system to improve cardiac electromechanical activation. Prevents damage due to antiphysiological contraction of the “conventional” ACE (apical of the right ventricle or the purely septal muscle). In search of this “physiological” alternative, different electrode placement sites in the right ventricle have been evaluated. We highlight the stimulation of the bundle of His, the area of the left branch, or biventricular stimulation for cardiac resynchronization, strategies included in a generic term: Cardiac Physiologic Pacing – CPP (1) and with promising results in preserving and/or restoring synchrony. cardiac electromechanics. To achieve this, in any case, it is of fundamental importance to have a tool that allows us to evaluate the result in terms of synchrony, ideally in real time during the ventricular lead implantation procedure.

The Synchromax® (Sy) is a device developed by a group of Argentine researchers led by Dr. Daniel Ortega (33). This device is capable of non-invasively identifying electrical dyssynchrony through a spectral and averaged analysis of many QRS of leads DII and V6 as expressions of the activation of the septum and the lateral wall of the LV respectively. As a result, two curves are obtained, one blue (DII) and the other red (V6), which, when superimposed and compared, report the direction of activation (from base to tip or vice versa), simultaneity of activation, and delays in spread (wide QRS). In addition to the curves, a synchrony value is obtained that is classified as Synchronous (0-0.4), Intermediate (0.4-0.7) and Asynchronous (>0.7) (figure 9).

Figure 9: Synchromax curves and values.

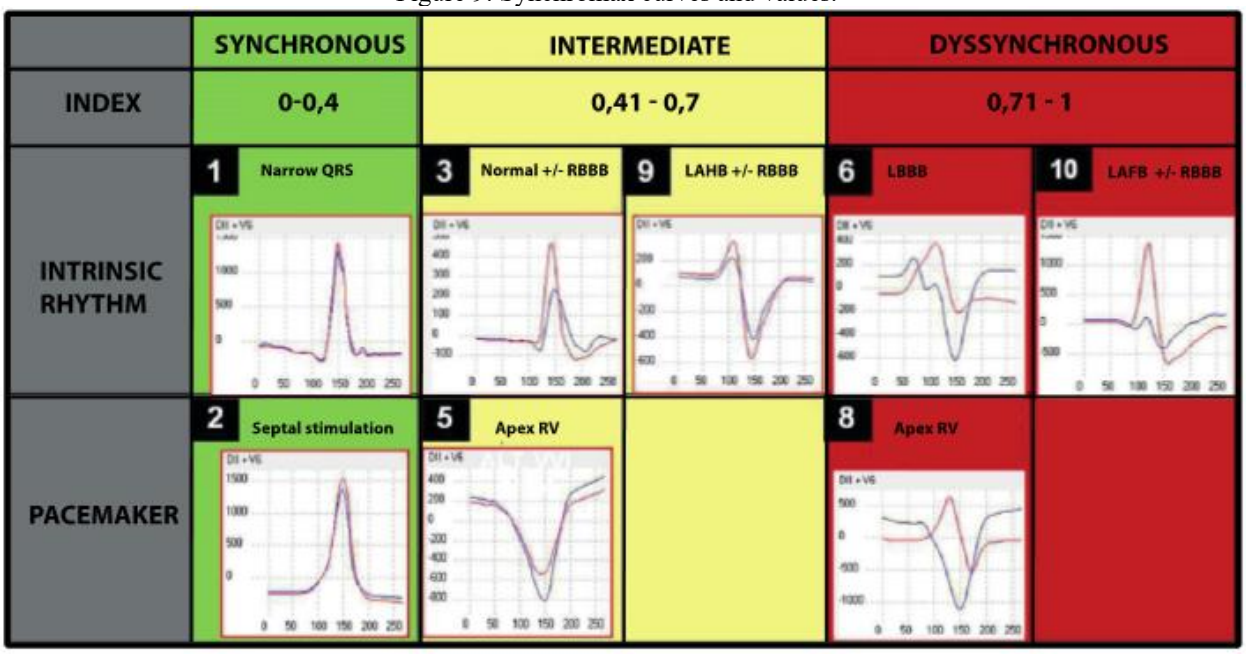


Figura 9: Curvas y valores del Synchromax.

By stimulating the septal aspect of the RVOT guided by Sy non-invasively and in real time, it is possible to obtain curves and adequate marker values of electrical synchrony. This could be explained by the coincidence of the site of activation by the artificial stimulus with the starting point of the electrical and mechanical activity described above in relation to the fulcrum and the helical myocardium.

7 OUR EXPERIENCE IN THE EVOLUTION OF CARDIAC STIMULATION

We evaluated at Cordis-Instituto del Corazón (city of Resistencia, Chaco, Argentina), 132 patients with bradyarrhythmias in whom pacemakers were implanted in the asp septal ecto of the RVOT (table 1). The majority were female (43%) and the average age was 62 years (44-81). In all cases, conventional active fixation catheters were used and real-time Sy was used during the procedure as a guide to define the appropriate implantation site of the stimulation catheter, looking for synchronous curves and indices (<0.4).

In the implants, curves and synchrony values were achieved, with adequate parameters at 129p (98%). The synchrony indices achieved were 0.20 ± 0.11 and the stimulation thresholds were 0.8 ± 0.7. No complications related to the procedures were observed. A follow-up period was carried out between 6 and 36 months, with no catheter displacements observed, the thresholds were stable and an upgrade of the PM stimulation site was not required in any case.

In conclusion, it is understood that the functional properties of myocardial fibers could be summarized in: a) their longitudinal contraction that gives rise to an increase in thickness perpendicular to the shortening process of the myocytes; b) the transmission of the electrical activation of one fiber

to the neighboring ones following the length of the myocardial band, and c) the fibers of the specific conduction tissue transmit the stimuli more quickly, and as they are distributed throughout the length and width of the subendocardium , linked directly to the atrioventricular conduction system, allow the action – coordinated and efficient electromechanical function of the heart (cardiac synchrony).

Based on our experience, we highlight that the technique and strategy used allows us to simplify and standardize the implantation of definitive electrodes in the RVOT, being an effective, safe and reliable procedure. Probably this form of stimulation may be ideal to avoid asynchrony in pacemaker-dependent patients. The advent of Sy as a tool to non-invasively define synchrony in real time during implants may be promising for standardizing the ideal site for definitive artificial ventricular pacing.

Table 1: Demographic characteristics and results of the population studied in our center.

A) CARACTERÍSTICAS DEMOGRÁFICAS DE LA POBLACIÓN	
Edad	62 (48-81)
Sexo femenino	56 (43%)
Tipo de marcapasos:	
- Unicamerales	31 (23%)
- Bicamerales	101 (77%)
B) RESULTADOS	
Implante TSVD	129 (98%)
Indices de Sincronía	0,20 ± 0,11 (0,07-0,38)
Detección de R (mV)	3,2±5
Impedancia (Ohms)	536±90
Umbral de estimulación (V)	0,8±0,7(0,4-1,1)
Tiempo de radioscopía (min)	7 (5,2-21)
Ancho QRS post implante (ms)	132±5

Tabla 1: Características demográficas y resultados de la población estudiada en nuestro centro.

REFERENCES

Chung MK, Patton KK, Lau C-P, Dal Forno ARJ, Al-Khatib SM, Arora V et al. 2023 HRS/APHRS/LAHRS guideline on cardiac physiologic pacing for the avoidance and mitigation of heart failure. Heart Rhythm 2023; 20(9):e17-e91.

Baldasseroni S, Opasich C, Gorini M, Lucci D, Marchionni N, Marini M et al. Left bundle-branch block is associated with increased 1-year sudden and total mortality rate in 5517 outpatients with congestive heart failure: a report from the Italian network on congestive heart failure. Am Heart J 2002; 143(3):398–405.

Rankinen J, Haataja P, Lyytikäinen L-P, Huhtala H, Lehtimäki T, Kähönen M et al. Relation of intraventricular conduction delay to risk of new-onset heart failure and structural heart disease in the general population. Int J Cardiol Heart Vasc 2020; 31:100639.

Wang NC, Maggioni AP, Konstam MA, Zannad F, Krasa HB, Burnett JC et al. Clinical implications of QRS duration in patients hospitalized with worsening heart failure and reduced left ventricular ejection fraction. JAMA 2008; 299(22):2656–66.

Kashani A, Barold SS. Significance of QRS complex duration in patients with heart failure. J Am Coll Cardiol 2005; 46(12):2183–92.

Tian Y, Zhang P, Li X, Gao Y, Zhu T, Wang L et al. True complete left bundle branch block morphology strongly predicts good response to cardiac resynchronization therapy. Europace 2013; 15(10):1499–506.

Auricchio A, Fantoni C, Regoli F, Carbucicchio C, Goette A, Geller C et al. Characterization of left ventricular activation in patients with heart failure and left bundle-branch block. Circulation 2004; 109(9):1133–9.

Manolis AS. The deleterious consequences of right ventricular apical pacing: time to seek alternate site pacing. Pacing Clin Electrophysiol 2006; 29(3):298–315.

Ferrari ADL, Borges AP, Albuquerque LC, Pelzer Sussenbach C, Da Rosa PR, Piantá RM et al. Cardiomyopathy induced by artificial cardiac pacing: myth or reality sustained by evidence? Rev Bras Cir Cardiovasc 2014; 29(3):402–13.

Ferrari ADL, Bartholomay EO, Tagliari AP, Kochi AN, Beuren TMA, Cabral GC et al. Cardiomyopathy Induced by Artificial Cardiac Pacing: To Whom, When, Why, and How? Insights on Heart Failure Development. Braz J Cardiovasc Surg 2023; 38(2):278–88.

Ferrari ADL. Avaliação de dessincronia atrioventricular em portadores de marca-passo bicameral devido à doença do nó sinusal e bloqueio atrioventricular de primeiro grau [thesis]. São Paulo: Universidade de São Paulo; 2017. 135 p.

Ferrari ADL, Bartholomay E, Velho FM, Borges AP, Fraga MB, Ley Domingues LM et al. Atrioventricular dyssynchrony in patients with permanent pacemaker due to sinus node dysfunction and first-degree atrioventricular block: does the long PR syndrome exist? JCCR 2022; 15(5):124–31.

Cleland JGF, Daubert J-C, Erdmann E, Freemantle N, Gras D, Kappenberger L et al. The effect of cardiac resynchronization on morbidity and mortality in heart failure. N Engl J Med 2005; 352(15):1539–49.

Mullens W, Grimm RA, Verga T, Dresing T, Starling RC, Wilkoff BL et al. Insights From a Cardiac Resynchronization Optimization Clinic as Part of a Heart Failure Disease Management Program. J Am Coll Cardiol 2009; 53(9):765–73.

Zareba W, Klein H, Cygankiewicz I, Hall WJ, McNitt S, Brown M et al. Effectiveness of Cardiac Resynchronization Therapy by QRS Morphology in the Multicenter Automatic Defibrillator Implantation Trial–Cardiac Resynchronization Therapy (MADIT-CRT). Circulation 2011; 123(10):1061–72.

Gold MR, Thébault C, Linde C, Abraham WT, Gerritse B, Ghio S et al. Effect of QRS Duration and Morphology on Cardiac Resynchronization Therapy Outcomes in Mild Heart Failure. Circulation 2012; 126(7):822–9.

Tracy CM, Epstein AE, Darbar D, DiMarco JP, Dunbar SB, Estes NM et al. 2012 ACCF/AHA/HRS Focused Update Incorporated Into the ACCF/AHA/HRS 2008 Guidelines for Device-Based Therapy of Cardiac Rhythm Abnormalities. J Am Coll Cardiol 2013; 61(3):e6-e75.

van Stipdonk AM, Hoogland R, Horst I ter, Kloosterman M, Vanbelle S, Crijns HJ et al. Evaluating Electrocardiography-Based Identification of Cardiac Resynchronization Therapy Responders Beyond Current Left Bundle Branch Block Definitions. JACC: Clinical Electrophysiology 2020; 6(2):193–203.

Birnie DH, Ha A, Higginson L, Sidhu K, Green M, Philippon F et al. Impact of QRS morphology and duration on outcomes after cardiac resynchronization therapy: Results from the Resynchronization-Defibrillation for Ambulatory Heart Failure Trial (RAFT). Circ Heart Fail 2013; 6(6):1190–8.

Deshmukh P, Casavant DA, Romanyshyn M, Anderson K. Permanent, direct His-bundle pacing: a novel approach to cardiac pacing in patients with normal His-Purkinje activation. Circulation 2000; 101(8):869–77.

Abdelrahman M, Subzposh FA, Beer D, Durr B, Naperkowski A, Sun H et al. Clinical Outcomes of His Bundle Pacing Compared to Right Ventricular Pacing. J Am Coll Cardiol 2018; 71(20):2319–30.

Burri H, Jastrzebski M, Vijayaraman P. Electrocardiographic Analysis for His Bundle Pacing at Implantation and Follow-Up. JACC Clin Electrophysiol 2020; 6(7):883–900.

Huang W, Wu S, Vijayaraman P, Su L, Chen X, Cai B et al. Cardiac Resynchronization Therapy in Patients With Nonischemic Cardiomyopathy Using Left Bundle Branch Pacing. JACC Clin Electrophysiol 2020; 6(7):849–58.

Sharma PS, Vijayaraman P, Ellenbogen KA. Permanent His bundle pacing: shaping the future of physiological ventricular pacing. Nat Rev Cardiol 2020; 17(1):22–36.

Burri H, Jastrzebski M, Cano Ó, Čurila K, Pooter J de, Huang W et al. EHRA clinical consensus statement on conduction system pacing implantation: endorsed by the Asia Pacific Heart Rhythm Society (APHRS), Canadian Heart Rhythm Society (CHRS), and Latin American Heart Rhythm Society (LAHRS). Europace 2023; 25(4):1208–36.

Pacopexia. Revista Española de Cardiología 2022; 75(11):857.

Cosín Aguilar J, Hernándiz Martínez A. The band arrangement of myocardial fibres determines cardiac morphology and function. Rev Esp Cardiol (Engl Ed) 2013; 66(10):768–70.

García Fernández MA. Torsión miocárdica. Interpretación anátomo-funcional de la mecánica cardíaca. Rev Argent Cardiol 2019; 87(6):500–1.

Trainini J, Lowenstein J, Beraudo M, Wernicke M, Trainini A, Llabata VM et al. Myocardial torsion and cardiac fulcrum. Morphologie 2021; 105(348):15–23.

Best A, Egerbacher M, Swaine S, Pérez W, Alibhai A, Rutland P et al. Anatomy, histology, development and functions of Ossa cordis: A review. Anat Histol Embryol 2022; 51(6):683–95.

Trainini J, Beraudo M, Wernicke M, Carreras Costa F, Trainini A, Mora Llabata V et al. The hyaluronic acid in intramyocardial sliding. REC: CardioClinics 2023; 58(2):106–11.

Trainini JC, Elencwajg B, López Cabanillas N, Herreros J, Lago N. Electrophysiological Bases of Torsion and Suction in the Continuous Cardiac Band Model; 2015.

Ortega D, Logarzo E, Barja L, Paolucci A, Mangani N, Mazzetti E et al. Novel implant technique for septal pacing. A noninvasive approach to nonselective his bundle pacing. J Electrocardiol 2020; 63:35–40.

Bimaxillary orthognathic surgery for correction of dentoskeletal deformity: Case report

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ABSTRACT
Class III dentoskeletal malocclusion is one of the most requested in terms of treatment. Request multidisciplinary therapy and a combination of orthodontics and surgery. Virtual pre-surgical planning helps minimize damage and achieve better results. The objective of this work is to describe the clinical picture of a patient with dentoskeletal deformity treated through bimaxillary orthognathic surgery, results obtained and postoperative follow-up. Orthognathic surgery has proven to be an effective treatment alternative to reestablish the function of the stomatognathic apparatus and balance facial aesthetics, combined with postoperative occlusal stability and patient satisfaction with the result.

Keywords: Orthognatic Surgery, Maxillofacial Surgery, Dentoskeletal Deformity.

1 INTRODUCTION

Class III malocclusion was first defined by Angle as the anteroposterior relationship between the maxilla and the mandible and is considered a dentofacial deformity (Angle, 1899). These deformities are usually characterized by a facial skeleton significantly different from normal in shape and/or size, which generates a malocclusion and impairs the aesthetics of the face (Fish, 1993), in addition to causing a series of functional difficulties, such as chewing and swallowing disorders, speech impairment and, in severe cases, breathing difficulties (Obwegeser, 2007).

Its origin can be congenital, developmental, hereditary, or traumatic (Obwegeser, 2007) and is related to mandibular skeletal protrusion, maxillary retrognathism, protrusive mandibular dentition, retrusive maxillary dentition and/or a combination of these factors (Magalhães, 2019). Its prevalence has no predilection for gender and varies according to ethnicity, being from 3 to 5% in white and black

ethnicities and 14% in yellow ethnicity, and ranging from 3.3% to 4.4% in the Brazilian population in population terms (Valdrighi, et al, 2010).

Class III malocclusions are considered the most challenging for orthodontic correction (Martins; Abdala, 2017), since patients with this type of malocclusion often present with dental crowding and crossbite, which significantly affects the aesthetics of the smile (Lamani et al., 2020) and the face by also presenting a sagittal discrepancy between maxilla and mandible, identified mainly in the lateral evaluation of the face, in addition to a straight or concave facial profile, due to maxillary deficiency, mandibular prognathism or the association of both (Capelozza Filho et al, 2002). They may also present with a short length of the anterior base of the skull, acute angle of the cranial base, obtuse gonial angle, vestibularized upper incisors and retroinclined lower incisors, in addition to an extremely low anterior facial height (Barakat et al., 2022).

Treatment options in patients presenting with dentofacial deformity may involve orthodontic treatment alone or in combination with orthognathic surgery, which aims to correct the relationship between arches (Singh et al., 2019).

Orthognathic surgery involves orthodontic and surgical treatment in a combined way, which makes it possible to achieve aesthetic and functional results in a satisfactory and harmonious way (Lamani et al., 2020). Careful facial analysis is necessary because it provides accurate surgical diagnosis and planning in order to define the amount of surgical movement required. Bimaxillary orthognathic surgery is indicated to avoid performing large isolated surgical movements (Teixeira; Scallop; Rodrigues, 2019), presenting greater stability and satisfactory facial aesthetic results (Lamani et al., 2020).

2 GOALS

2.1 GENERAL OBJECTIVE

To describe the clinical picture of a patient with dentoskeletal deformity treated by orthognathic surgery, results obtained and postoperative follow-up.

2.2 SPECIFIC OBJECTIVES

- Report the surgical aspects of the approach performed;
- To report the postoperative follow-up and outcomes found.

3 LITERATURE REVIEW

3.1 AESTHETICS OF THE FACE AND DENTOFACIAL DEFORMITY

The inevitable connection between the face and the person is present from the moment of his birth and remains so until his death. The face conveys not only the spontaneous impression of a person,

but also his life identity. It can be said, then, that it becomes the mirror of the soul. Morphologically, each face presents distinct characteristics and proportions, which makes each individual a unique being (Radlanski; Wesker, 2016).

When the harmony and facial and dental proportions escape from normality, there is then the so-called dentofacial deformity. Such disproportions can be severe enough to affect the quality of life of the individual, since they cause serious damage to the aesthetics of the face (Proffit; Fields; Sarver, 2008), which commonly generates an emotional shock in these people, due to low self-esteem and diminished confidence levels caused both by unfavorable aesthetics and by the physiological problems associated with their condition (Soh; Narayanan, 2013).

Dentofacial deformity is a problem whose establishment of the exact etiological factor is difficult, or even impossible depending on the case. It is known, however, that this anomaly is related to development, with some of the probable causes, environmental and hereditary factors (Proffit; White; Sarver, 2005).

The similarity between parents and children who have some dentofacial problem is undeniable, which emphasizes the role of heredity and family tendency, but does not make them final determinants for such a condition (Obwegeser, 2007).

3.2 OCCLUSION AND MALOCCLUSIONS

Occlusion is essential in the analysis of positional variations of teeth and dental arches (Peck, 2009).

It can be defined as normal, the stable, healthy, and aesthetically satisfactory occlusion, where all the teeth are in complete harmony with the static and dynamic forces that act on them, in addition to being ordered correctly in the dental arch (Ferreira, 2021). Malocclusions can be defined as irregularities in the positions of the teeth. Also called dysplasias, these irregularities can be dental, skeletal, or dentoskeletal. And they can simultaneously affect the bone, muscle, tooth and nerve systems of the facial region (Ferreira, 2021).

Edward Hartley Angle, in addition to being the founder of orthodontics as a dental specialty, was also the first to conceptualize malocclusions, in 1899 (Peck, 2009). By analyzing the dentition of the dental arches from a sagittal point of view and having as reference the mesiovestibular cusps of the first upper molars, Angle divided the dental malocclusions into three distinct classes, in addition to the normal occlusion (ANGLE, 1899).

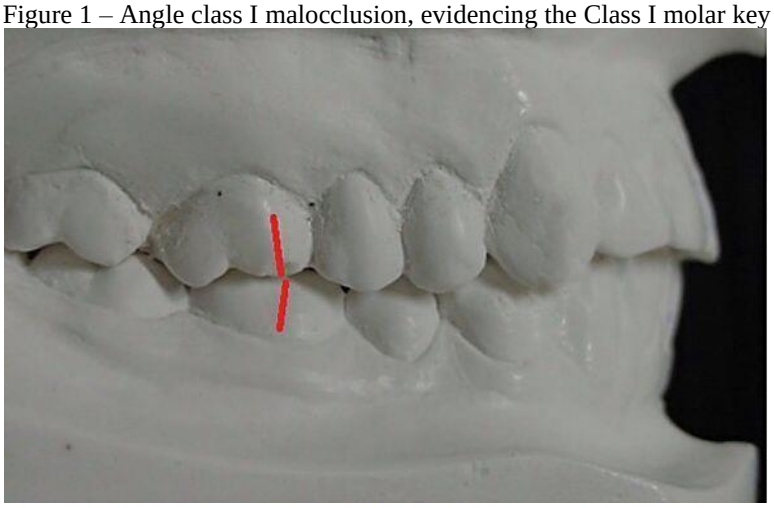
3.2.1 Angle Class I

Angle's Class I malocclusion is characterized by a normal anteroposterior relationship in the molars, evidenced by the "molar wrench" (Fig. 1) that may or may not be accompanied by skeletal

changes - in the vertical or transverse planes - or dental. Angle defined molar key as the correct occlusion between the upper and lower permanent molars, in which the mesiovestibular cusp of the 1st upper molar occludes the mesiovestibular sulcus of the 1st lower molar (Angle, 1899).

Although there is a correct sagittal relationship between the dental arches, the anterior teeth present in disharmony, caused by factors such as crowding or dental biprotrusion, due to the sharp inclination of the upper and lower incisors to the vestibular, added to the excessive horizontal trespasse (Angle, 1899).

Figure 1 – Angle class I malocclusion, evidencing the Class I molar key

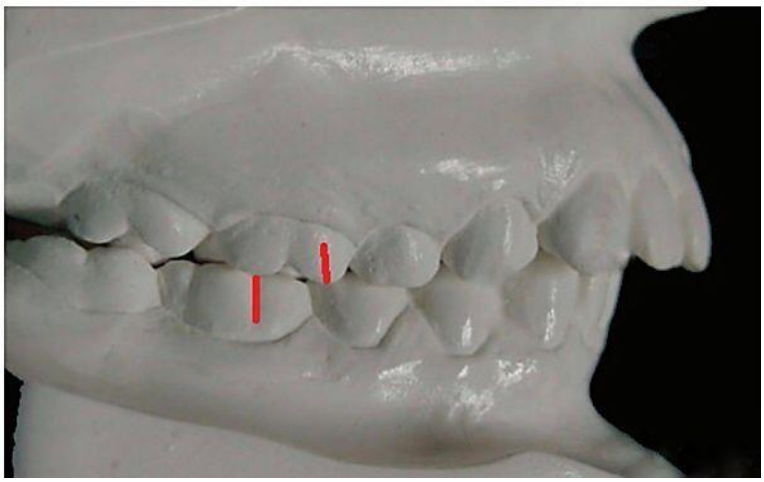


Source: (Foggiato et al., 2020)

3.2.2 Angle Class II

Class II malocclusion is defined when an abnormal mesio-distal relationship of the molars is present, with all lower teeth occluding to distal in relation to normal occlusion (Fig. 2), resulting in a disharmony in the incisive region and facial lines. It can still be subdivided into 2 parts according to the slope of the upper incisors, where the 1st division is characterized by the protrusive inclination of these teeth, added to an atypical function of the lips and some degree of nasal obstruction and mouth breathing. The 2nd division is characterized by excessive lingual inclination of the upper incisors, associated, mostly, with a normal oral and nasal function (Angle, 1899).

Figure 2 – Angle class II malocclusion, evidencing the Class II molar relationship

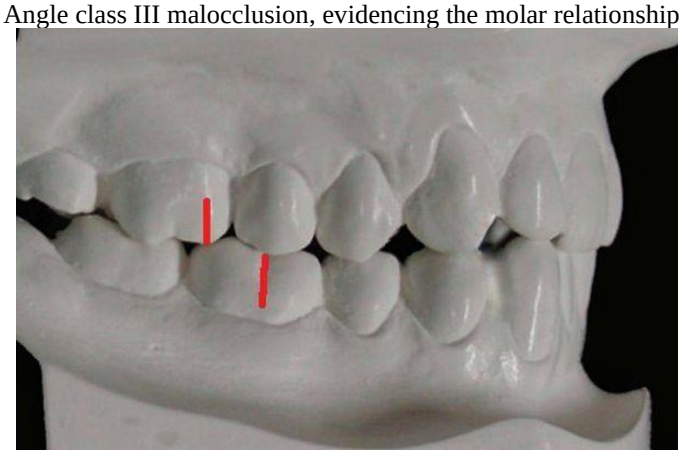


Source: (Foggiato et al., 2020)

3.2.3 Angle Class III

Class III malocclusion also occurs when there is an abnormal mesio-distal relationship of the molars. However, it differs from class II, because in the present situation, the lower teeth occlude to mesial in relation to the normal occlusion (fig.3), which often causes a top-to-top bite or a cross in the anterior region o, in addition to an excessive inclination of the lower incisors to the lingual, due to the exaggerated pressure that the lower lip exerts during the mouth closing movement (Angle, 1899).

Figure 3 – Angle class III malocclusion, evidencing the molar relationship of Class III



Source: (Foggiato et al., 2020)

It is important to note that when only one side presents the relation of Class II or III, the subdivision for that side should be called (Angle, 1899).

3.3 CLASSIFICATION OF SKELETAL MALOCCLUSION

Although simple and objective, Angle's classification relies only on the occlusal relationship of the first molars, so it becomes limited to many malocclusions (Tseng; Chang; Roberts, 2016). This is since changes in the growth pattern or in the rate at which growth occurs may result in the abnormal

morphology of the skeleton of the face and the malocclusion that accompanies it (Proffit; White; Sarver, 2005). That is, malocclusion encompasses a broad spectrum of heterogeneous morphological patterns of changes in craniofacial growth that impact the occlusal relationship (Frutos-Valle et al., 2019).

Furthermore, its classification assumes that the relationship established between the first upper molar and the zygomatic crest would be constant. Thus, all dysgnathia would originate in the mandible, while the maxilla would be constant and stable, which would not consider the fact that the dentition/upper maxilla may have equal or exclusive contribution in the cause of the patient's deformity (Obwegeser, 2007).

Class III skeletal malocclusion can then be defined as an alteration in the facial skeleton of maxillary, mandibular or mixed etiology, which can be diagnosed by cephalometric measurements. It is important to say, however, that morphology cannot be precisely determined by such measurements alone (Frutos-Valle et al., 2019).

3.4 MULTIDISCIPLINARY TEAM IN THE TREATMENT OF MALOCCLUSIONS

The assistance of a multidisciplinary team is required in the treatment of patients with congenital or acquired deformities of the bones and soft tissues of the face, so that maximum rehabilitation is achieved and thus, the initial approach should be made by general practitioners, periodontists and, if necessary, endodontists and prosthetists (Hupp; Ellis; Tucker, 2009).

It is necessary that the patient's dentition has been fully restored and his periodontal condition is stable so that the orthodontist and the oral and maxillofacial surgeon can start planning the dentofacial correction, taking into account that orthodontic and surgical interventions can only be initiated after all the patient's oral adequacy has been performed (Fish et al., 1993).

3.5 TREATMENT OF DENTOFACIAL DEFORMITIES

Historically, the treatment of malocclusions, even those associated with dentofacial problems, was done with the aim of correcting dental anomalies. Not infrequently, dental corrections were performed by means of intermaxillary elastics to correct a skeletal class III occlusion. Such a feat sometimes managed to mask the skeletal disharmony between the upper and lower jaws, but for the most part, the cases treated were not successful (Graber, 1977). Due to the emphasis given to dental occlusion, little attention was paid to the analysis of skeletal deformity and the facial aesthetics to which they are associated (Hupp; Ellis; Tucker, 2009). And in some cases orthodontic intervention alone tends to worsen facial appearance (Fish et al., 1993).

Modern orthodontics represents a paradigm shift by emphasizing the dentofacial appearance, with a greater concern regarding oral and facial soft tissues (Proffit; Fields; Sarver, 2008).

Treatment options differ for a growing individual - pre-pubertal - and an individual who no longer grows - post-pubertal (Singh et al., 2019). Therefore, the earlier the diagnosis and the earlier the start of treatment, the greater the likelihood of a correct relationship of the bone bases (Magalhães, 2019), better orthopedic responses, as well as the improvement of the patient's self-esteem (Valdrighi h, et al, 2010). In addition, in the prepubertal phase, surgical therapy is not necessary, because at this stage, facial deformities can be corrected through interceptive treatment, with the use of face masks (Oltramari-Navarro et al., 2013). In individuals who have already gone through the growth phase, the treatment of choice is orthognathic surgery. It aims to correct facial and maxillomandibular irregularities, in addition to providing adequate dental positioning (Lima Júnior, N. et. al, 1999). For this, it involves orthodontic and surgical treatment in a combined way, which makes it possible to achieve aesthetic and functional results in a very satisfactory and harmonious way (Lamani et. al, 2020). Thus, it is necessary to perform a careful facial analysis, because from it can be made a precise diagnosis and surgical planning, in order to define the amount of surgical movement to be performed to obtain facial harmony. For this, it is commonly indicated the combined surgery of maxilla and mandible in order to avoid the performance of large movements isolated surgeries, since recurrences may occur otherwise (Teixeira; Scallop; Rodrigues, 2019). In addition, the bimaxillary technique presents stability and very satisfactory facial aesthetic results (Lamani et. al, 2020). Since in the treatment of Class III skeletal patients from rigid fixation, in addition to the combination of maxillary advancement and mandibular recoil, the maxilla remains in its post-surgical position in about 80% of the patients, and almost does not present significant recurrence (Ngan; Moon, 2015).

Patients with dentofacial anomalies, who will be submitted to the surgical process, undergo two orthodontic interventions. The first, pre-surgical, may last from a few months to 2 years (Fish et al., 1993). Called preoperative orthodontic decompensation, it should be performed to assess the actual discrepancy and allow for maximum repositioning of the jaw (Barakat et al., 2022), as well as achieve alignment, decompensation, and arch coordination, prior to surgery (Anwar et al, 2022). Thus, better surgical planning can be achieved, which consequently produces optimal therapeutic outcomes (Barakat et al., 2022); and the second, post-surgical, which aims at the refinement and final adjustments of the occlusion. This stage will be initiated 4 to 8 weeks after surgery, only after the patient's recovery is verified, in which a stable correction of the dentofacial deformity and a normal maxillomandibular function are achieved. The conduct to be taken in each of the two stages varies according to the degree of the patient's deformity and the dental changes it generates, the level of dental crowding and the orthodontist's approach to making modifications that allow the surgery to be performed satisfactorily (Fish et al., 1993).

Panoramic and cephalometric lateral radiographs are tools that aid the diagnosis in the clinical evaluation of the facial structure and occlusion of the patient. Cephalometric radiography can be

evaluated by several techniques that help determine the nature of the facial skeleton anomaly. Along with it, other imaging tests may also be requested that will be useful in the elaboration of the final diagnosis, such as anterior poster facial shots, TMJ images - if indicated -, and conventional or cone-beam computed tomography. In addition, today, computerized digital technology contributes to the integration of cephalometric data into the digital image of the face, which improves the analysis of the relationships between the underlying facial skeleton and the soft tissue that overlays it (Hupp; Ellis; Tucker, 2009). Digital surgical simulation also enables planning through virtual osteotomy in 3D models of patients, which causes more and more surgeries to be planned through this technique, since virtual models detect and correct hidden problems prior to the surgical procedure (Ho et al., 2017). What's more, these approaches provide more intuitive and accurate spatial representations of craniofacial morphology than landmark-based measurements of lines and angles (Ngan; Moon, 2015). This consequently contributes to obtaining more satisfactory results, since 3D planning outperforms 2D planning in correcting midline deviation, branch asymmetry, occlusal plane inclination, and chin position (Ho et al., 2017).

4 CASE REPORT

Patient JLC, male, 24 years old, leucoderma, presented as main complaints the functional difficulty in feeding, chewing and speaking properly, associated with the complaint about the unfavorable facial aesthetics "my chin is too big" (sic), which, according to the patient's report, compromised him to interact socially, smile and talk with other people.

Through the facial analysis performed, the type III facial pattern was observed, demonstrating mandibular protrusion and maxillary hypoplasia, resulting in a concave, elongated facial profile and inverted lower lip with absence of sealing (Fig. 4).

Figure 4 – Photographs of the face in the preoperative period: A) Profile photograph showing the type III facial pattern; B) Frontal photograph, the elongated face is observed; C) Oblique photograph of the face, showing absence of lip sealing and mandibular prognathism.



Source: Authors' Collection, 2023.

Cephalometric radiographic examination (Fig. 5) showed mandibular prognathism and anteroposterior maxillary growth deficiency, generating a marked horizontal dental trespass.

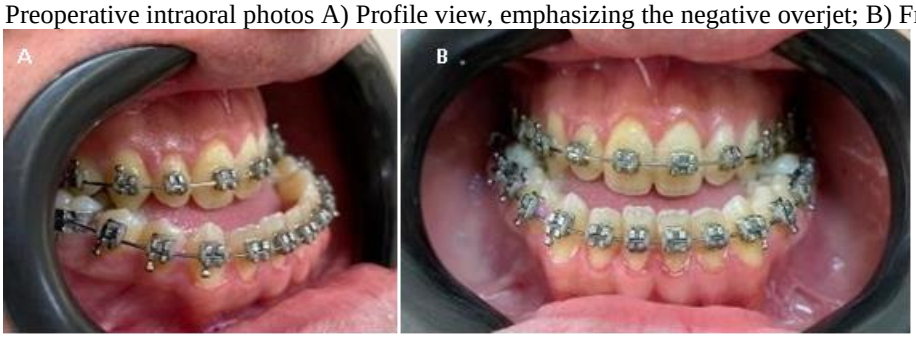
Figure 5 – Preoperative cephalometric radiography.



Source: Authors' Collection, 2023.

The intra-oral physical examination revealed the presence of mandibular protrusion, with negative overjet of 11mm (Fig. 6) which, according to reports, made it impossible to correctly seize the food.

Figure 6 - Preoperative intraoral photos A) Profile view, emphasizing the negative overjet; B) Front view.



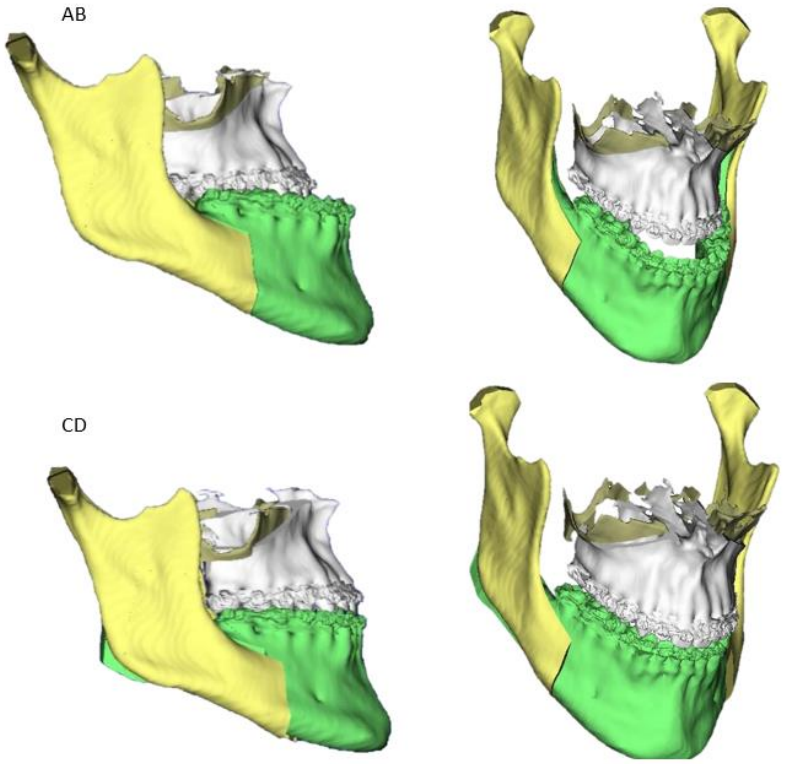
Source: Authors' Collection, 2023.

After clinical evaluation, imaging exams (radiographs and tomography) and dynamic analysis of the plaster models, the final diagnosis was class III skeletal malocclusion, due to the bone and dental association that culminated in the patient's dentofacial deformity.

The treatment of choice was orthosurgical, and initially the preoperative orthodontic preparation was performed, lasting 24 months, which allowed a maxillomandibular discrepancy and adequate occlusal stability to perform the surgical procedure. The bimaxillary orthognathic surgery, under general anesthesia, was initiated through the maxilla, through circumvestibular access and Le

Fort I osteotomy, which allowed the advancement of 7mm of the maxilla. The final position of the maxilla was defined through an intermediate guide generated through virtual planning performed in the Dolphin software and printed by means of 3d biomedical prototyping (fig.7).

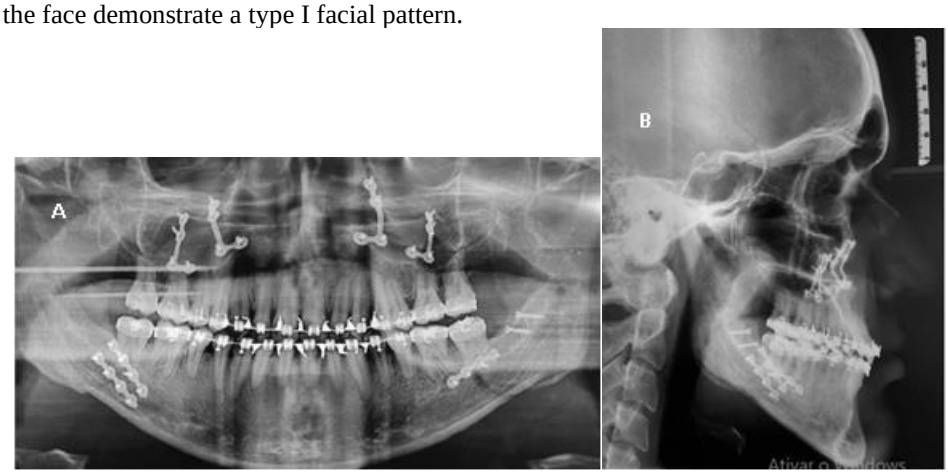
Figure 7 – Images of the virtual planning demonstrate in A and B the initial state in the lateral and oblique lateral views, respectively. In C and D, the final positioning of the advanced maxillary and recessed mandibular segments is demonstrated, in the lateral and lateral oblique views, respectively.



Source: Authors' Collection, 2023.

The rigid internal fixation of the maxilla in the planned position was performed by means of 4 mini-plates in L and screws of the 2.0mm system (fig.9A). The access to the mandible was the vestibular, followed by the 6mm recoil through the use of the sagittal osteotomy of the mandibular branches (OSRM) and followed the new position of the maxilla, being fixed by means of 2 straight mini-plates and screws of the 2.0mm system on the right side and 1 straight mini-plate and 2 bicortical screws on the left side (fig.9B). The closure of the accesses was done by first intention and Vicryl 5.0 resorbable wire was used.

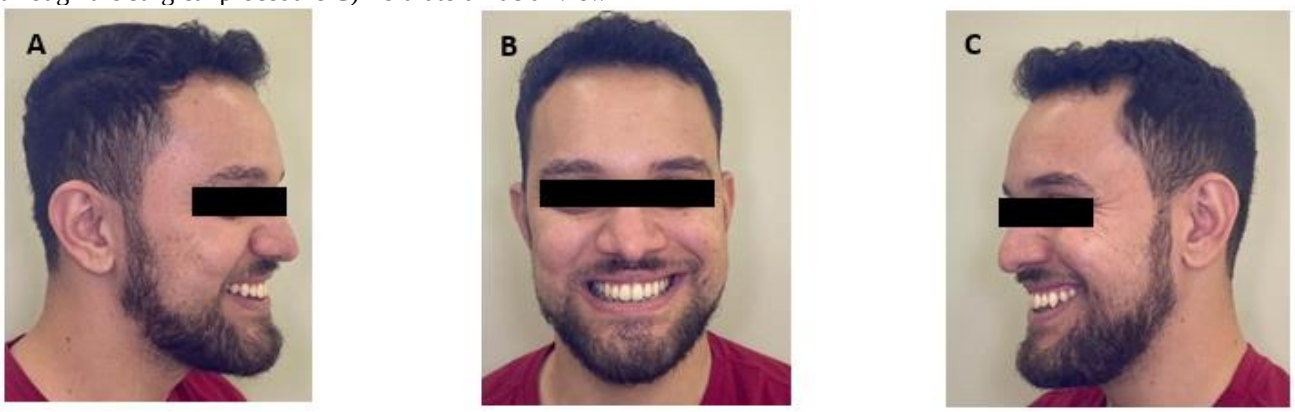
Figure 9 – Follow-up radiographs of 1 postoperative week A) Control panoramic radiography, showing the 4 maxillary plates and 3 mandibular plates installed for bone fixation B) The cephalometric changes observed through the lateral cephalogram of the face demonstrate a type I facial pattern.



Source: Authors' Collection, 2023.

There were no intercurrences in the intraoperative and immediate postoperative periods, and the patient was discharged from the hospital the day after surgery. At 21 days postoperatively, the patient was released for continuity of orthodontic treatment aimed at refining the new occlusion. The patient is under follow-up for 1 year postoperatively (Fig. 10), presenting stable occlusion, with no signs of recurrence, using upper mobile orthodontic restraint and in the final phase of orthodontics of the lower arch. The patient reports resolution of aesthetic and functional complaints, indicating satisfaction with the result obtained.

Figure 10 – Follow-up postoperative facial photos after 1 year A) Right profile facial view, showing expressive improvement in the patient's profile view B) Frontal facial view, emphasizing more harmonious face and smile, achieved through the surgical procedure C) Left lateral facial view



Source: Authors' Collection, 2023.

Figure 11 - Follow-up postoperative intraoral photos after 1 year A) Right profile view B) Left lateral view C) Frontal view, evidencing the correction of the horizontal trespasse



Source: Authors' Collection, 2023.

5 DISCUSSION

The present case brings the bimaxillary surgical approach for correction of a class III dentoskeletal deformity. the surgical intervention was performed due to the severe degree of mandibular protrusion, hypoplastic maxilla, as well as the aesthetic and functional limitations presented by the patient.

Mandibular prognathism associated with maxillary retrognathism is a rather challenging maxillofacial deformity (Barakat et al., 2022). Treatment of this type of malocclusion requires a combination of skeletal and dental changes (Magalhães, 2019). Therefore, the earlier the diagnosis and the initiation of treatment, the faster and more stable its results will be (Ngan; Moon, 2015).

Currently, for the treatment of mandibular prognathism there are therapeutic alternatives that include early growth modification, orthodontic treatment, or a combination of surgical and orthodontic treatments (Barakat et al., 2022). To choose the best type of procedure for patients with Class III skeletal malocclusion, it is important to take into account facial aesthetics, since in these patients, orthodontics alone would have little or no effect on the aesthetics of the face in general (Lamani et al., 2022).

Facial growth modification may be an effective method for resolving class III skeletal mandibular discrepancies (Barakat et al., 2022). However, as the age of the patient in the present case report was 24 years, modifying his craniofacial growth was not an option. In addition, orthodontic treatment alone would not be able to camouflage the existing discrepancies, due to their magnitude, since the patient had a severe discrepancy with negative overjet of 11 mm, which resulted in a wide

anterior crossbite. Therefore, a combination of surgery and orthodontics was considered appropriate for this case.

Generally, a class III malocclusion leads to compensation of dental discrepancy, where the retroinclination of the lower incisors and vestibularization of the upper incisors in relation to the alveolar process is caused due to the great pressure exerted by the muscles surrounding the mouth (Barakat et al., 2022). The preoperative orthodontic treatment helps in the leveling and alignment of the dental arches and seeks to eliminate expressive interferences in the occlusion (Huang; Hsu; Chen, 2014).

Mandibular prognathism can be treated through jaw recoil, maxillary advancement, or a combination of both (Barakat et al., 2022). Due to the large negative overhang and retrognathic maxilla of the patient in the present case, the surgical technique chosen was the combination of maxillary advancement surgeries - Le Fort I- and mandible recoil - ORSM-, also known as bimaxillary surgery. This technique has better stability and less chance of relapse, which was confirmed one year after surgery.

Basically, the treatment of most maxillofacial deformities can be done through four basic osteotomies: the maxilla with Le Fort I type osteotomy, the mandible with the sagittal osteotomy of the branch, the vertical osteotomy of the branch and the horizontal osteotomy of the chin (Krishnamurthy et al., 2022).

Commonly, Le Fort I osteotomy in bimaxillary orthognathic surgery is used for the repositioning of the maxilla in three dimensions (3D) (Govaerts et al, 2018). The Le Fort I technique is used to resolve almost the entire range of anteroposterior, transverse, vertical, and rotational skeletal maxillary deformities. In addition, with this procedure the position of the upper lip, the nasal tip, and the lip angle can be changed without affecting the orbitozygomatic region (Patel; Novia, 2007)

Currently, the main procedure used to correct most cases of retrognathism and mandibular prognathism is the sagittal osteotomy of the branch - ORSM (Krishnamurthy et al., 2022) due to its versatility, as it can be used both in cases of mandibular advancement and retreat and in mandibular asymmetries (Tsuji et al., 2005; Santos et al., 2022). Among the advantages of this type of osteotomy is the excellent flexibility in the repositioning of the distal segment, adequate bone contact after the repositioning of the segments and minimal changes in the position of the temporomandibular muscles and joints (Kim, Y.; Kim, S.; Kim, J., 2011; Santos et al., 2022). When it comes to virtual planning, the advent of 3D imaging is relatively recent. Before that, craniofacial analysis had to be done only in 2 dimensions, by means of 2D cephalometry (Gateno et al, 2011) that does not provide complete information about 3D structures, especially in cases of patients with large deformities or facial asymmetries (Alkhayer et al, 2020).

3D analysis is used to examine the symmetry of facial structures (Gateno et al, 2011). In addition, the 3D virtual planning of the case was done to simulate the results that would be achieved, being possible to visualize the mandibular recoil and maxillary advancement to be performed, in addition to detecting and correcting possible hidden problems prior to the surgical procedure. And with that, make an intermediate surgical guide printed in 3D technology (biomedical prototyping).

Virtual planning in orthognathic surgery enables a more accurate result, with less risk of distortions when compared to conventional model surgery.

6 CONCLUSION

Orthognathic surgery proved to be an effective treatment alternative in the restoration of the function of the stomatognathic apparatus and balance of facial aesthetics, combined with postoperative occlusal stability and patient satisfaction with the result.

REFERENCES

Angle EH.; Classification of malocclusion. Dent Cosmos, v. 41, p. 248-64, 1899. ANWAR, Mudasir; BENINGTON, Philip C.M.; GILLGRASS, Toby J.; AYOUB, Ashraf F.. Surgery-first approach for correction of class III dentofacial deformity with Le Fort I osteotomy; is it advantageous? British Journal Of Oral And Maxillofacial Surgery, [S.L.], v. 60, n. 9, p. 1234-1239, nov. 2022. Elsevier BV. http://dx.doi.org/10.1016/j.bjoms.2022.07.005.

BARAKAT, Ali et al. A case report on surgical–orthodontic correction of skeletal class III malocclusion with severe prognathic mandible and retrognathic maxilla. Journal Of Pharmacy And Bioallied Sciences, [S.L.], v. 14, n. 5, p. 1054, 2022. Medknow. http://dx.doi.org/10.4103/jpbs.jpbs_85_22.

CAPELOZZA FILHO, Leopoldino et al. Tratamento ortodôntico da classe III: revisando o método (ERM e tração) por meio de um caso clínico. Revista Dental Press de Ortodontia e Ortopedia Facial, v. no/dez, n. 6, p. 99-119, 2002Tradução.. Acesso em: 07 set. 2023.

FISH, L. C.; EPKER, B. N.; SULLIVAN, C. R. Orthognathic surgery: the correction of dentofacial deformities. Journal of Oral and Maxillofacial Surgery, v. 51, n. 1, p. 28-41, 1993.

FERREIRA, Flávio Velline. Livro Ortodontia: diagnóstico e planejamento clínico.
8. ed. S.I: Santos Publicações, 2021. 588 p.

FOGGIATO, Augusto Alberto et al. Classificação de Angle: uma sugestão de modificação pela relação sagital de caninos. Odonto, [S.L.], v. 27, n. 53, p. 19, 18 maio 2020. Instituto Metodista de Ensino Superior. http://dx.doi.org/10.15603/2176- 1000/odonto.v27n53p19-27.

FRUTOS-VALLE, Leixuri de et al. Subclustering in Skeletal Class III Phenotypes of Different Ethnic Origins: a systematic review. Journal Of Evidence Based Dental Practice, [S.L.], v. 19, n. 1, p. 34-52, mar. 2019. Elsevier BV. http://dx.doi.org/10.1016/j.jebdp.2018.09.002.

GRABER, Lee W.. Chin cup therapy for mandibular prognathism. American Journal Of Orthodontics, [S.L.], v. 72, n. 1, p. 23-41, jul. 1977. Elsevier BV. http://dx.doi.org/10.1016/0002-9416(77)90122-1.

Ho, CT., Lin, HH., Liou, E. et al. Simulação cirúrgica tridimensional melhora o planejamento para correção de prognatismo e assimetria facial: um estudo qualitativo e quantitativo. Scientific Reports 7 , 40423 (2017). https://doi.org/10.1038/srep40423

HUANG, Chiungshing; HSU, Samsheng-Pin; CHEN, Yu-Ray. Systematic review of the surgery-first approach in orthognathic surgery. Biomedical Journal, [S.L.], v. 37, n. 4, p. 184, 2014. Elsevier BV. http://dx.doi.org/10.4103/2319-4170.126863.

HUPP, James R.; ELLIS, Edward; TUCKER, Myron R.. CIRURGIA ORAL E MAXILOFACIAL CONTEMPORÂNEA. 5. ed. São Paulo: Elsevier Editora Ltda., 2009. 704 p.

KIM, Young-Kyun; KIM, Su-Gwan; KIM, Jong-Hwa. Altered Sensation After Orthognathic Surgery. Journal Of Oral And Maxillofacial Surgery, [S.L.], v. 69, n. 3, p. 893-898, mar. 2011. Elsevier BV. http://dx.doi.org/10.1016/j.joms.2010.10.025.

KRISHNAMURTHY, Subalakshmi et al. The Versatility of Extraoral Vertical Ramus Osteotomy for Mandibular Prognathism: a prospective study. Cureus, [S.L.], p. 1-13, 18 dez. 2022. Cureus, Inc.. http://dx.doi.org/10.7759/cureus.32673.

LAMANI, E. et. al. Esthetic considerations in na orthodontic-orthognathic patient with class III skeletal malocclusion. Jornal Americano de Ortodontia e Ortopedia Dentofacial, Alabama, v. 161, p. 1, maio de 2022.

LIMA JÚNIOR, N. et al. O que significa cirurgia ortognática?. arquivos de Ciências e Saúde Unipar, v. 3, n. 3, p. 273-276, set./dez., 1999.

MAGALHÃES, A.C.S. Tratamento Precoce da Má Oclusão de Classe III com Máscara Facial: Ancoragem dentária vs Ancoragem esquelética. 2019, v. 54. Disssertação (Mestrado em cirurgia ortognática e ortodontia) – curso de medicina- Universidade do Porto, Porto, 2019.

MARTINS, Cássia Geovane Soares; ABDALA, Luiz Pedro. TRATAMENTO DO PADRÃO III, CLASSE III COM USO DE MÁSCARA FACIAL: revisão de literatura. 2017. 38 f. Monografia (Especialização) - Curso de Odontologia, Faculdade de Sete Lagoas, Sete Lagoas, 2017.

NGAN, Peter; MOON, Won. Evolution of Class III treatment in orthodontics. American Journal Of Orthodontics And Dentofacial Orthopedics, [S.L.], v. 148, n. 1, p. 22-36, jul. 2015. Elsevier BV. http://dx.doi.org/10.1016/j.ajodo.2015.04.012.

OBWEGESER, J. A. Maxillary and midface deformities: characteristics and treatment strategies. Clinics in Plastic Surgery, v. 34, n. 3, p. 519-533, 2007.

OLTRAMARI-NAVARRO, Paula Vanessa Pedron; ALMEIDA, Renato Rodrigues de; CONTI, Ana Cláudia de Castro Ferreira; NAVARRO, Ricardo de Lima; ALMEIDA, Marcio Rodrigues de; FERNANDES, Leandra Sant'Anna Ferreira Parron. Early Treatment Protocol for Skeletal Class III Malocclusion. Brazilian Dental Journal, [S.L.], v. 24, n. 2, p. 167-173, abr. 2013. FapUNIFESP (SciELO). http://dx.doi.org/10.1590/0103-6440201301588.

PATEL, Pravin K.; NOVIA, Michael V.. The Surgical Tools: the lefort i, bilateral sagittal split osteotomy of the mandible, and the osseous genioplasty. Clinics In Plastic Surgery, [S.L.], v. 34, n. 3, p. 447-475, jul. 2007. Elsevier BV. http://dx.doi.org/10.1016/j.cps.2007.05.012.

PECK, Sheldon. Editorial - The contributions of Edward H. Angle to dental public health. Community Dental Health, [S.L.], p. 130-131, 2009. FDI World Dental Press LTD. http://dx.doi.org/10.1922/CDH_2570Peck02

PROFFIT, William R.; WHITE, Raymond P.; SARVER, David M.. Tratamento Contemporâneo de Deformidades Dentofaciais. Porto Alegre: Artmed, 2005. 784 p

PROFFIT, William R.; FIELDS, Henry W.; SARVER, David M.. Ortodontia Contemporânea. 4. ed. São Paulo: Elsevier Editora Ltda, 2008. 718 p.

RADLANSKI, Ralf J.; WESKER, Karl H.. A Face: atlas ilustrado de anatomia clínica. 2. ed. São Paulo: Quintessence Editora, 2016. 354 p.

SANTOS, Victor Diniz Borborema dos et al. Evaluation of the Anatomic Position of the Mandibular Canal Regarding to the Segments of the Mandibular Sagittal Split Ramus Osteotomy to Diminish the Possibility of Injuries: a pilot study. Journal Of Oral And Maxillofacial Research, [S.L.], v. 13, n. 4, p. 1-14, 31 dez. 2022. Stilus Optimus. http://dx.doi.org/10.5037/jomr.2022.13402.

SINGH, Abhishek; JAIN, Shalu; AGGARWAL, Sumit; MAHAJAN, Tanvi; SINGH, Sameep; BANSAL, Vishwas. A transdisciplinary approach for treatment of class III malocclusion. Journal Of Family Medicine And Primary Care, [S.L.], v. 8, n. 10,
p. 3412, 2019. Medknow. http://dx.doi.org/10.4103/jfmpc.jfmpc_601_19.

SOH, C.L.; NARAYANAN, V.. Quality of life assessment in patients with dentofacial deformity undergoing orthognathic surgery—A systematic review. International Journal Of Oral And Maxillofacial Surgery, [S.L.], v. 42, n. 8, p. 974-980, ago. 2013. Elsevier BV. http://dx.doi.org/10.1016/j.ijom.2013.03.023.

TEIXEIRA, André Luiz de Sousa; VIEIRA2, Nathalia Barros; RODRIGUES, Camila Medeiros. OSTEOTOMIA LE FORT I ALTA PARA TRATAMENTO DE PACIENTES PADRÃO III: série de casos clínicos. Brazilian Journal Of Surgery And Clinical Research - Bjscr. Imperatriz, Ma, p. 42-46. 30 abr. 2019. Disponível em: http://www.mastereditora.com.br/bjscr. Acesso em: 14 set. 2023.

VALDRIGHI H, Vedovello SAS, Lucato A, Tubel CAM. Diagnóstico, Prognóstico e Tratamento da Má Oclusão de Classe III. Nova Visão em Ortodontia e Ortopedia Funcional dos Maxilares. São Paulo: Santos, 2010:163- 67.

TSENG, Linda L.y.; CHANG, Chris H.; ROBERTS, W. Eugene. Diagnosis and conservative treatment of skeletal Class III malocclusion with anterior crossbite and asymmetric maxillary crowding. American Journal Of Orthodontics And Dentofacial

TSUJI, Y. et al. Computed tomographic analysis of the position and course of the mandibular canal: relevance to the sagittal split ramus osteotomy. International Journal Of Oral And Maxillofacial Surgery, [S.L.], v. 34, n. 3, p. 243-246, maio 2005. Elsevier BV. http://dx.doi.org/10.1016/j.ijom.2004.06.001.

ANNEX A – APPROVAL OPINION OF THE RESEARCH ETHICS COMMITTEE – CEP

UNIVERSIDADE FEDERAL DOS VALES DO JEQUITINHONHA E MUCURI - UFVJM

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: CIRURGIA ORTOGNÁTICA BIMAXILAR PARA TRATAMENTO DE MALOCLUSÃO DENTÁRIA EM PACIENTE COM PADRÃO FACIAL TIPO III: RELATO DE CASO.

Pesquisador: OLGA BEATRIZ LOPES MARTINS

Área Temática:

Versão: 2

CAAE: 68896023.2.0000.5108

Instituição Proponente:

Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 6.175.870

Apresentação do Projeto:

As informações aqui elencadas foram retiradas do arquivo Informações Básicas da Pesquisa (PB_Informações_Básicas_do_projeto_68896023.2.0000.5108, de 25/05/2023):

A má oclusão classe III é considerada uma deformidade dentofacial e é caracterizada por um esqueleto facial significativamente diferente do normal em forma e/ou tamanho, o que gera uma má oclusão e prejudica a estética da face. Em alguns casos é necessário uma intervenção cirúrgica, por meio da cirurgia ortognática. Tal procedimento se refere ao "alinhamento da mandíbula e da maxila" e tem por objetivo a correção de irregularidades faciais e maxilomandibulares, além de um adequado posicionamento dentário. Desta forma, o objetivo do trabalho será descrever o quadro clínico de um paciente com deformidade dentoesquelética tratado por meio de cirurgia ortognática, resultados obtidos e acompanhamento pós-operatório.

Critério de Inclusão: Paciente que foi submetido à cirurgia ortognática devido a deformidade dentoesquelética, com padrão facial tipo III.

Objetivo da Pesquisa:

As informações aqui elencadas foram retiradas do arquivo Informações Básicas da Pesquisa (PB_Informações_Básicas_do_projeto_68896023.2.0000.5108, de 25/05/2023):

Endereço: Rodovia MGT 367 - Km 583, nº 5000, Campus JK, prédio da reitoria, sala 21
Bairro: Alto da Jacuba **CEP:** 39.100-000
UF: MG **Município:** DIAMANTINA
Telefone: (38)3532-1240 **Fax:** (38)3532-1200 **E-mail:** cep.secretaria@ufvjm.edu.br

Objetivo Primário: Descrever o quadro clínico de um paciente com deformidade dentoesquelética tratado por meio de cirurgia ortognática, resultados obtidos e acompanhamento pós-operatório.

Avaliação dos Riscos e Benefícios:

As informações aqui elencadas foram retiradas do arquivo Informações Básicas da Pesquisa (PB_Informações_Básicas_do_projeto_68896023.2.0000.5108, de 25/05/2023):

Riscos: O risco relacionado ao paciente com sua participação no trabalho pode ser a sua possível identificação nos relatórios. Para minimizar esse risco, os seus dados pessoais serão confidenciais e protegidos. Além disso, as imagens ou outros registros publicados e divulgados não permitirão sua identificação. Trata-se de um estudo observacional, não prevê intervenção ao paciente, portanto o sujeito da pesquisa não será afetado. Sua identidade e privacidade serão preservados. Ao paciente será garantido o direito de privacidade e confidencialidade dos seus dados. A avaliação do prontuário será realizada em um local reservado e em momento algum será possibilitada a identificação do sujeito como participante do caso clínico. O relato do caso não permitirá a identificação do paciente, sem a indicação do nome e/ou fotos que permitam a sua identificação.

Benefícios: Não se aplica

Comentários e Considerações sobre a Pesquisa:

As informações aqui elencadas foram retiradas do arquivo Informações Básicas da Pesquisa (PB_Informações_Básicas_do_projeto_68896023.2.0000.5108, de 25/05/2023):

Trata-se de um estudo observacional transversal que será realizado com o prontuário de um paciente submetido ao procedimento de cirurgia ortognática. Será realizada a consulta do prontuário odontológico do paciente a fim de extrair os seguintes dados: 1– Coleta de dados dos pacientes: Idade, sinais, sintomas e aspectos clínicos; 2– Avaliação das descrições clínicas e exames de imagem; 3– Descrição das abordagens utilizadas; 4– Descrição da proservação do caso. Será realizada a avaliação do prontuário do paciente na clínica de Cirurgia e Traumatologia Bucomaxilofacial da UFVJM e a coleta de dados será realizada pela aluna de graduação, bem como a escrita do relato do caso clínico. O orientador e coorientadores serão responsáveis pela revisão e auxílio no desenvolvimento do trabalho.

Considerações sobre os Termos de apresentação obrigatória:

Vide campo:"Conclusões e Pendências e Lista de Inadequações"

Recomendações:

Vide campo:"Conclusões e Pendências e Lista de Inadequações"

Conclusões ou Pendências e Lista de Inadequações:

Trata-se de analise de resposta de parecer pendente nº 6.035.631, emitido pelo CEP em 02/05/2023:

Anexar a Carta de Anuência do local onde será realizado o projeto

ANALISE: ATENDIDA

Considerações Finais a critério do CEP:

- Segundo a Carta Circular nº. 003/2011/CONEP/CNS, de 21/03/11, no momento da obtenção do TCLE, há obrigatoriedade de rubrica em todas as páginas do mesmo, pelo sujeito de pesquisa ou seu responsável e pelo pesquisador. O pesquisador responsável deverá apor sua assinatura na última página do referido termo.

- O Relatório final deverá ser apresentado ao CEP ao término do estudo em 30/09/2023. Considera-se como antiética a pesquisa descontinuada sem justificativa aceita pelo CEP que a aprovou.

- Caso haja quaisquer intercorrências durante a execução do projeto de pesquisa é de responsabilidade do pesquisador responsável comunicá-la através de uma emenda ao CEP via Plataforma Brasil. Considera-se como antiética a pesquisa com modificações em seu protocolo inicial previamente aprovado sem justificativa aceita pelo CEP que a aprovou.

O projeto atende aos preceitos éticos para pesquisas envolvendo seres humanos preconizados na Resolução 466/12 CNS.

Este parecer foi elaborado baseado nos documentos abaixo relacionados:

Endereço: Rodovia MGT 367 - Km 583, nº 5000, Campus JK, prédio da reitoria, sala 21
Bairro: Alto da Jacuba **CEP:** 39.100-000
UF: MG **Município:** DIAMANTINA
Telefone: (38)3532-1240 **Fax:** (38)3532-1200 **E-mail:** cep.secretaria@ufvjm.edu.br

Tipo Documento	Arquivo	Postagem	Autor	Situação
Informações Básicas do Projeto	PB_INFORMAÇÕES_BÁSICAS_DO_PROJETO_2088310.pdf	25/05/2023 17:16:49		Aceito
Outros	CARTA_DE_ANUENCIA.pdf	25/05/2023 17:16:04	OLGA BEATRIZ LOPES MARTINS	Aceito
Projeto Detalhado / Brochura Investigador	Projeto.docx	17/04/2023 16:14:41	OLGA BEATRIZ LOPES MARTINS	Aceito
Folha de Rosto	Folha_de_Rosto.pdf	17/04/2023 16:14:02	OLGA BEATRIZ LOPES MARTINS	Aceito
Cronograma	CRONOGRAMA_DAS_ATIVIDADES.docx	17/04/2023 16:07:24	OLGA BEATRIZ LOPES MARTINS	Aceito
TCLE / Termos de Assentimento / Justificativa de Ausência	TCLE.pdf	17/04/2023 16:06:05	OLGA BEATRIZ LOPES MARTINS	Aceito

Situação do Parecer:

Aprovado

Necessita Apreciação da CONEP:

Não

DIAMANTINA, 11 de Julho de 2023

Assinado por:

THAMAR KALIL DE CAMPOS ROLLA MIRANDA

(Coordenador(a))

SEVEN publicações acadêmicas

DATASUS and the challenges in the collection and dissemination of health information for the black population

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ABSTRACT
Health information with a racial cut is a relevant instrument for the planning of actions and interventions to combat social inequalities. Such information was indispensable for the formulation of the National Policy for the Integral Health of the Black Population. However, these data do not yet present a completeness that allows analyzing the entire trajectory of the citizen in the health services at the municipal level. The article aims to present the difficulties of access and the gaps of completeness of the DATASUS data in the municipality of Camaçari, and to present a reflection on how these gaps hinder the estimation, dissemination, and application of indicators with racial focus for the follow-up and evaluation of inclusive health policies. Through quantitative methodology, an analysis of the available data on the use of health services with racial cuts, using the tabnet and tabwin systems, was carried out. It is demonstrated that most of the records ignore the question about the race-color of the users; The few who present it are insufficient to make a complete and reliable diagnosis.

Keywords: DATASUS, Race-color question, Black population, Racial indicators, Health.

1 INTRODUCTION

In 2001, the III World Conference against Racism, Racial Discrimination, Xenophobia and Related Intolerances was held in Durban, South Africa, which had as its product a Declaration and Plan of Action which presented a series of measures to combat racism in all sectors of social life, including health. Following the time frame, we also highlight the creation, in 2003, of the Secretariat of Policies for the Promotion of Racial Equality (SEPPIR), the social movements that guided the health of the black population, especially the Black Movement and the Women's Movement, began to have a differentiated dialogue with the government, enabling the incorporation of historical demands. According to the first Minister of SEPPIR, Matilde Ribeiro (2003-2008) the demands received in the health area, in this period, presented a well-structured content with the bases for the construction of a national policy, and it was up to the secretariat to promote and monitor the developments with the Ministry of Health. This process culminated in the establishment of the Comprehensive Health Policy for the Black Population, based on Ordinance No. 992, of May 13, 2009. (Santos, 2016)

In accordance with the National Policy on Health Information and Informatics (PNIIS), we can affirm that health information is a structuring element for universality, integrality, and social equity in health care. This represents a relevant instrument for the design, monitoring and evaluation of the results of social policies and for the planning of actions and interventions.

With regard more specifically to the health of the black population, such information was indispensable for the formulation of the National Policy for the Integral Health of the Black Population - PNSIPN, however these data do not yet present a completeness and dissemination that allows analyzing the entire trajectory of the citizen in the health services. The race-color question is fundamental for the collection of health information from the black population. From these indicators it is possible to visualize with greater precision the situation, the obstacles, and the advances of the PNSIPN. In addition to attention to the quality of collection of this information by health professionals, the way these data are estimated, used, and disseminated also needs to be evaluated.

The Department of Informatics of the Unified Health System – DATASUS, is institutionalized as the information technology agency, linked to the Ministry of Health, with the responsibility of collecting, treating, analyzing, and disseminating information in articulation with the municipal and state levels. However, some obstacles in the management of information technologies – IT, have hindered the performance of this department in the fulfillment of its functions and its functioning and access are still restricted to managers and need to be reorganized.

We will present in this article the difficulties of access and the gaps of completeness of the DATASUS data in the municipality of Camaçari, followed by a reflection on how these gaps hinder the estimation, dissemination and application of indicators with a racial cut.

This work is the product of the research *Racial Discrimination and Equal Rights: The implementation of the National Policy for the Integral Health of the Black Population and the Program to Combat Institutional Racism in the municipality of Camaçari, Bahia*, carried out with the support of CNPq and the Ministry of Health, and coordinated by Prof. Dr. Maria Cristina Gomes da Conceição.

2 METHODOLOGY

Through quantitative methodology, an analysis of the available data on the use of health services with racial cuts, was carried out. To capture the information by electronic means, the tabnet and tabwin data tabulation tools were used, accessible on the DATASUS website (http://datasus.saude.gov.br/) and for the elaboration of the tables the excel program was used.

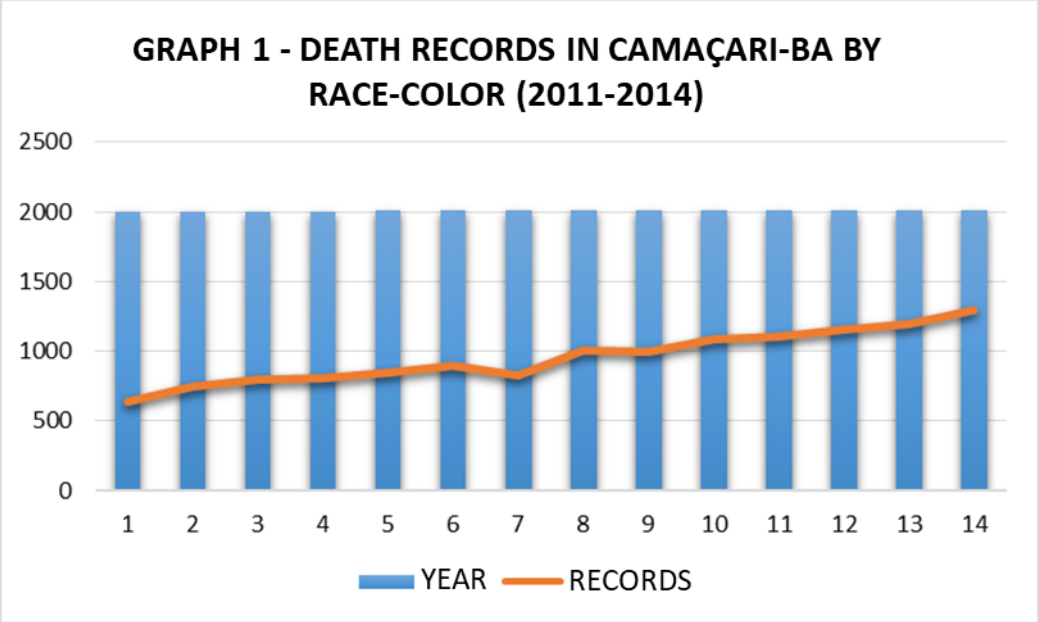
This is a study of municipal scope, in which the data of the municipality of Camaçari on vital statistics of birth and mortality were analyzed. It is worth mentioning that the data on ethnicity and race, coming from the Information System on Live Births (SINASC) and the Mortality Information System (SIM) - Mortality and Live Births, should be collected through the heterodefinition, that is, in

the absence or impossibility of the reference person to answer, the declaration of race/color should be made by another person, usually the health professional or the family member in charge.

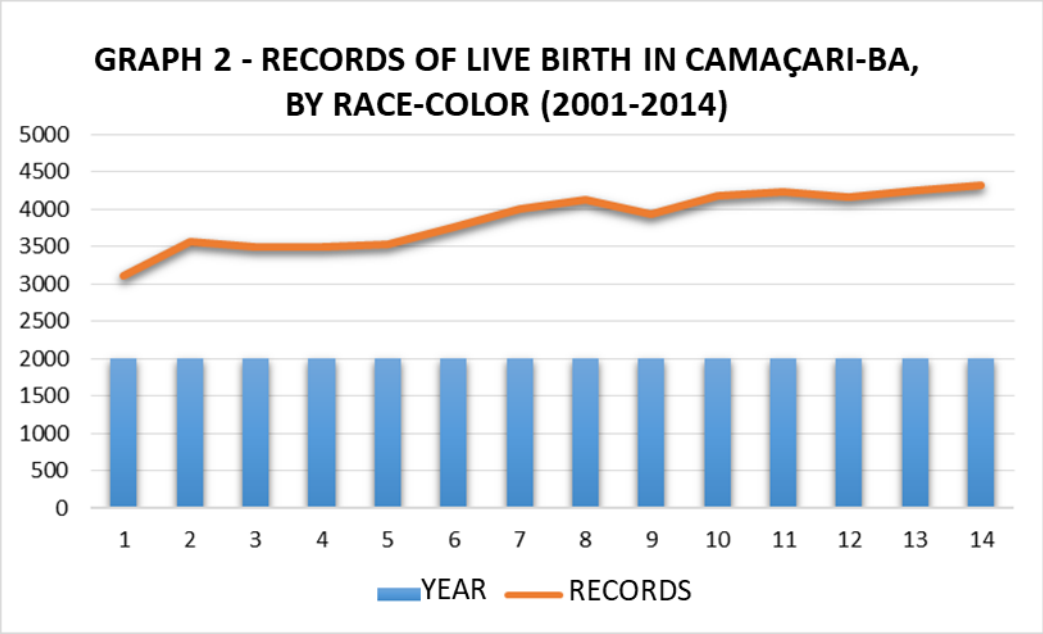
The data accessed during the research cover the period from 1996 to 2014, the most recent of 2015 and 2016 were not yet available. In this work, in view of the objective of analyzing the most current information and encompassing the period of most advances for affirmative action policies in the country, we made a time frame of the last 14 years and presented the data from 2001 to 2014.

3 RESULTS

Based on the analysis of the data collected, we can observe in Graphs 1 and 2 the gradual growth of records of the race-color item in the systems of vital events, during the years 2001 to 2014, in the municipality of Camaçari-Ba.



Source: Own estimates, based on MS/SVS/CGIAE - Mortality Information System - SIM



Source: Own estimates, based on MS/SVS/DASIS - Information System on Live Births - SINASC

Although this growth is considered an advance for the development of health information with a cut-off by race-color, it is worth noting that the completeness of this data is still limited when we analyze its coverage and quality. One of the relevant aspects when we analyze the coverage of the data is the inclusion of the "ignored" option among the possible answers, because at the time of filling out the question, employees tend to mark this category, for different reasons.

The history of racism in our country, as well as the issue of miscegenation that is often used to reinforce the myth of racial democracy is also reflected in the collection of this question. In health facilities, in many cases the forms do not have the question about race-color and, when they do, it is not valued or there is an embarrassment on the part of professionals and service users at the time of questioning and answering about race-color. In some cases, to avoid asking this question, professionals leave this item blank or, when there is the option "ignored" in the form, prefer to mark it or, if there is no such option, mark "not declared", compromising the collection of the data.

Another aspect that limits the quality of the data is the collection through heterodefinition. This method, which consists of the declaration of race-color made by third parties should only be used given the impossibility of self-declaration, which is the internationally recommended method and the most used by the IBGE in its research. This is the case of information on live births and death, which is usually declared by health professionals, or responsible family members, and may suffer cultural influences from these.

In the IBGE censuses and surveys, when asked the question about race-color, almost all the interviewees manage to fit into one of the five pre-established groups (white, black, brown, yellow, indigenous), and also manage to define the color of their children, elderly and disabled relatives. Several surveys were done to know if this question was reliable, or if it was better to ask another person

trained by the researchers to give their opinion on the color and race of the respondent. Comparing the results, it was concluded that the color given by the person himself was confirmed by the color given by another person in the vast majority of cases. And, most importantly, for ethical and dignity reasons, it is more appropriate for the individual to define himself. (Osorio, 2003). Currently, most people spontaneously answer one of the five colors defined by the IBGE, without the interviewer having to read the colors that are written in the questionnaire. Thus, it can be concluded that, to the extent that the race-color question becomes a common procedure in the services, there will be no estrangement on the part of the user population, nor of the professionals in care and, with this, new health policies can be thought of and the existing ones will be strengthened, based on the statistics generated.

According to Osório (2003), for the IBGE the category "black" encompasses people who declare themselves black or brown. Currently there is a great proximity between the term moreno, common in spontaneous responses, and the term pardo, one of the IBGE questions. Both terms represent the "middle ground", the miscegenation between whites and blacks, but the category "pardo" is still the most used, as we will see in the analysis of the data of vital events of the municipality of Camaçari-Ba.

Analyzing table 1, we can observe that from 2010, the number of records of newborns declared brown decreases slightly, while the number of newborns declared white and black increases considerably, with the largest increase observed among blacks, who even surpass the records of white newborns. This change demonstrates a greater openness to the racial definition of the black population, according to the objectives of the inclusive policies implemented in the country.

TABLE 1 - Number of live births in Camaçari-Ba by color-race, 2001-2014

YEAR	WHITE	BLACK	YELLOW	BROWN	INDIGENA	IGNORED	TOTAL
2001	85	48	17	2.874	11	80	**3.115**
2002	76	30	6	3.272	7	170	**3.561**
2003	54	14	33	3.226	6	159	**3.492**
2004	66	13	18	3.176	1	219	**3.493**
2005	58	15	8	3.329	2	129	**3.541**
2006	189	25	5	3.545	1	4	**3.769**
2007	161	30	9	3.794	-	8	**4.002**
2008	151	37	8	3.935	-	3	**4.134**
2009	104	30	6	3.767	-	34	**3.941**
2010	121	33	6	3.998	1	16	**4.175**
2011	295	314	23	3.520	5	85	**4.242**
2012	210	309	21	3.517	14	89	**4.160**
2013	246	292	17	3.574	4	124	**4.257**
2014	231	342	20	3.605	6	118	**4.322**
TOTAL	**2047**	**1532**	**197**	**49.132**	**58**	**1238**	

Source: Own estimates, based on MS/SVS/DASIS - Information System on Live Births - SINASC

In the records of deaths, in table 2, we observed that in the period analyzed the majority was also defined as brown, and what draws the most attention is the decrease in cases with ignored color,

reinforcing the tendency to a racial definition, which still needs to continue to be worked on to improve the coverage and quality of records and information with racial cut.

TABLE 2 - Number of deaths in Camaçari-Ba by color-race, 2001-2014

YEAR	WHITE	BLACK	YELLOW	CURTAIN	INDIGENOUS	IGNORED	TOTAL
2001	84	88	-	360	-	107	**639**
2002	92	125	1	386	-	142	**746**
2003	102	121	2	468	-	99	**792**
2004	133	134	1	465	1	69	**803**
2005	114	119	1	548	-	68	**850**
2006	131	142	1	573	-	49	**896**
2007	137	119	1	518	-	49	**824**
2008	161	196	2	603	-	42	**1.004**
2009	154	182	1	624	-	38	**999**
2010	177	188	-	679	-	44	**1.088**
2011	188	176	2	691	-	48	**1.105**
2012	171	197	1	731	-	58	**1.158**
2013	194	205	1	746	1	44	**1.191**
2014	207	195	2	847	2	38	**1.291**
TOTAL	**2045**	**2187**	**16**	**8239**	**4**	**895**	

Source: Own estimates, based on MS/SVS/CGIAE - Mortality Information System - SIM

In this study it was possible to analyze only the available data with a reliable coverage: of births and deaths. The other information systems on prevention and care have a higher rate of non-response or "ignored" race-color.

For this reason, with regard to the challenges of access and dissemination of information with racial cut, we understand that it is important to reflect on the advances and limitations of DATASUS in the management of Information Systems.

According to the Master Plan for Information Technology – PDTI, a document prepared by the Ministry of Health that presents the diagnosis and planning of technological resources for the years 2014 and 2015, although DATASUS is the central IT body in the Ministry of Health located in the Federal District, the management of this process is not limited to the department. This is due to the large number of autonomous centers that do not always act in an integrated manner to the technological and regulatory processes of DATASUS, compromising the safety and quality of the services provided by the department.

In this sense, the PDTI itself states that there are islands of information management, which function as independent systems within the IT of the Ministry of Health. For example, the user identification database does not connect with the databases on consultations, hospitalizations, tests, diagnoses, surgeries, among others. This disconnect between the information bases in the areas of prevention, care and management demonstrates the difficulty of DATASUS, as a central body, to balance and meet the specific needs of municipalities and states, respecting the principle of

decentralization of the SUS, without harming the surveillance, standardization and integration of the computerization of health systems. It also demonstrates the existence of barriers to access to the information produced to generate scientific evidence and production of research for the follow-up, evaluation of results of health policies and promotion of equity, in addition to hindering social control by the population.

We also note, in the aforementioned document, that there is no certainty as to the number of Information Systems managed by DATASUS. It is stated that there are about 171 information systems, divided into health systems, with emphasis on internal policies and systems related to the management of the Ministry, the PDTI 2016 speaks of "hundreds" of systems. However, when accessing the department's website, (http://datasus.saude.gov.br/) we found available only 42 systems divided into: national, epidemiological, outpatient, social, regulatory, financial, hospital, structuring and vital events systems, and not most do not present the data by race.

In an attempt to develop greater integration between these national systems and improve data dissemination, DATASUS developed the tools TabWin, TabNet, and Cadernos de Informações em Saúde, but these are insufficient in the current organizational scenario of the department. Despite this advance, access to this data is limited and, in some cases, restricted to health workers. This limits social control and the conduct of studies based on these data. With regard to racially charged information, its completeness is even more incomplete, because the question about ethnicity-race is absent in most of the formats present in services at all levels of care and management, hindering the right of researchers to access the data stored in DATASUS and limiting the coverage and quality of records by race-color.

4 FINAL CONSIDERATIONS

Given the analysis of the data presented and the reflection on the importance of the racial cut in data collection for information systems and the gaps of DATASUS in data management, we conclude that it is necessary a joint effort of managers and other health workers, from the three levels of government, especially the municipalities, to carry out actions aimed at fostering better collection, with revision of forms, and a better use of health information.

As we have seen, at the national level interventions are already being carried out with the objective of developing the integration and interoperability of health systems, to improve the coverage and dissemination of data. However, due to the intensity and complexity of these gaps in the central scope of DATASUS management, and the urgency of generating indicators in the health of the black population, it is necessary that municipal administrations develop their own means to generate their own information with a racial cut and, thus, produce scientific evidence to evaluate the implementation, results and impact of the PNSIPN.

In this perspective, it is up to the municipal and state management to provide the necessary structure and instruments for the health team to collect data and promote local information systems. This means inserting the race-color item in all SUS forms and documents and also encouraging private establishments, as well as promoting and collaborating with permanent education actions including the theme of the health of the black population and institutional racism in training. It is important that management also stimulates the production of knowledge on this theme, encouraging research and work that aims to contribute to the implementation of the PNSIPN. Properly trained and instrumentalized, it is up to the health professionals the technical responsibility in the collection of the question, to guide the users on the IBGE classification standards and to respect and encourage the self-declaration of the race-color and to correctly make the heterodefinition when necessary.

In addition, it is important to foster the creation of local information systems that can not only meet the demands of the Ministry of Health but also local needs, from a municipal database that allows analyzing the entire trajectory of the citizen in health services with attention to the racial cut of these data.

In this sense, the research project "Racial Discrimination and Equal Rights: The implementation of the National Policy for the Integral Health of the Black Population and the Program to Combat Institutional Racism in the Municipality of Camaçari, Bahia", after a diagnosis of the completeness of the municipality's data by race-color, offered training on this theme to health professionals and worked with managers to develop a pilot information system that can serve in the future for the construction of a municipal database.

It is important to highlight the efforts of professionals who understand the importance of information for the services, such as a worker from the Support Unit for People with Sickle Cell Disease (UNIFAL) of Camaçari-Ba who developed, with few resources, an internal system in the unit for control and monitoring of the users served, with a breakdown by race-color. This shows, therefore, that it is possible to create possibilities to ensure the implementation of the Comprehensive Health Policy of the Black Population, improve the provision of services to this group and also the production of ethnic-racial indicators and, as a consequence, generate scientific evidence that contributes to promote racial equity in health.

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REFERENCES

BARBOSA, Elisana Lisboa. DATASUS: A disponibilidade e relevância da informação racial para diminuir as desigualdades na saúde. Salvador, 2016.

BRASIL. Ministério da Saúde - DATASUS/SGEP/MS. Plano Diretor de Tecnologia da Informação do Ministério da Saúde 2016. Brasília-DF, 2016.

BRASIL. Ministério da Saúde. Política Nacional de Informação e Informática em Saúde. Editora: Ministério da Saúde – Brasília, 2016.

BRASIL. Ministério da Saúde. Política Nacional de Saúde Integral da População Negra uma política do SUS. 2a edição – 2013.

OSORIO, Rafael Guerreiro. O sistema classificatório de "cor ou raça" do IBGE. Brasília, 2003.

SANTOS, Katia Regina da Costa (Org.); SOUZA, Edileuza Penha (Org.). SEPPIR - Promovendo a Igualdade Racial para um Brasil sem Racismo. 1ª Edição Brasília, 2016.

Public policies in Brazil: An analysis of prenatal care and prematurity

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ABSTRACT
This scientific article presents an analysis of public policies in Brazil related to prenatal care and prematurity. The study seeks to understand the government's approach to prenatal care offered to pregnant women and the impact of these policies on the incidence of premature births in the country. For this, a literature review was carried out, examining scientific studies and official documents that address the subject. The analysis revealed that prenatal care in Brazil is offered free of charge by the Unified Health System (SUS) and aims to monitor pregnancy and identify possible complications early. However, despite efforts to improve access to and quality of prenatal care, there are still challenges to be faced, such as the need to improve the training of health professionals and the infrastructure of care units. Public policies for early intervention aim to minimize the impacts of prematurity, with actions that include adequate respiratory support, the promotion of breastfeeding, the prevention and treatment of infections, among other measures. Given the challenges identified, the study concludes that it is essential to improve public policies in Brazil for prenatal care and prematurity. Investments in training of health professionals, preventive actions and adequate support for pregnant women can contribute to reducing the incidence of premature births and improving the quality of life of babies and their families. In addition, the awareness of society about the importance of prenatal care and adequate care for premature babies is essential for the promotion of a more effective and comprehensive maternal and child health in the country.

Keywords: Prematurity, Public Health Policies, Neonatal care, Complications of prematurity.

1 INTRODUCTION

Comprehensive care for premature newborns is an issue of great relevance in the area of child health and well-being. Preterm birth, defined as birth before 37 weeks of gestation, is a complex challenge that requires interdisciplinary approaches, involving health professionals, adequate public policies and the awareness of society. The implications of practices and public policy in relation to the care of premature newborns are extremely important, as they directly influence the quality of life of these babies and their families (Klossoswski *et al*., 2015).

The premature newborn usually requires intensive multiprofessional health care in neonatal units, with a highly qualified team, including neonatologists, specialized nurses, physiotherapists, speech therapists, among others. The quality of this care and the availability of appropriate

technologies and resources can significantly impact the development of the premature baby (Oliveira, 2023).

Prenatal care is a crucial phase for the monitoring of the pregnant woman and the development of the fetus, being a time when regular medical consultations, examinations and guidelines are carried out to ensure a healthy and safe pregnancy for the mother and baby. The quality of prenatal care is directly related to the early diagnosis of possible complications, allowing the adoption of measures to reduce risks and treat health problems identified during pregnancy (Mendes; Alcantara, 2023).

In Brazil, the Unified Health System (SUS) offers free prenatal care to all pregnant women, through the Basic Health Units (UBS) and Health Centers. However, the effectiveness of this service may vary by region and resource availability. Public policies that aim to improve the training of health professionals, the infrastructure of care units and access to tests and medicines are fundamental to ensure the quality of prenatal care throughout the country (Oliveira, 2023).

Therefore, care for premature babies should occur in specialized neonatal units, where a multidisciplinary team provides intensive care. Measures such as respiratory support, proper nutrition, prevention and treatment of infections, developmental monitoring and therapeutic interventions are essential for the treatment and recovery of the premature baby. In addition, the promotion of breastfeeding is a crucial factor in improving the health of premature infants (Gonzaga *et al*., 2016).

To reduce the incidence of prematurity, preventive actions are necessary. These actions include access to adequate prenatal care and control of modifiable risk factors, such as smoking and the use of illicit drugs during pregnancy. The encouragement of family planning and health policies that promote adequate care during pregnancy are fundamental in this context (Oliveira, 2023)Thus, considering the relevance of the subject, this study aims to discuss the existing public policies in Brazil in relation to prenatal care and its prematurity.

2 METHOD

It is a narrative review of the literature with a broad approach that aims to understand the development of a given subject, either from a theoretical or contextual perspective, through the investigation and analysis of the scientific production available in the literature (Brum *et al*., 2015). This review provides a comprehensive compilation of information, addressing various topics and enabling the identification of knowledge gaps that may be useful to reorient public policies and support future research.

A search was performed from the following databases: Latin American and Caribbean Literature on Health Sciences (Lilacs), Scientific Electronic Library Online (Scielo) and National Library of Medicine (PubMed). The keywords used were searched in the descriptor system (DeCS).

The terms selected for the search included: "prematurity", "public health policies", "neonatal care", "complications of prematurity".

These keywords were chosen with the objective of covering different aspects related to prematurity, including its definition, related health policies, neonatal care and associated complications. For each database, the appropriate Boolean operators (such as AND, OR) were used to combine the keywords appropriately and obtain relevant results. The search was carried out in order to cover studies published until the deadline of this research.

The identified studies were evaluated for their relevance to the objective of the review. In this stage, the inclusion and exclusion criteria were applied to select the most pertinent studies. The inclusion criteria were articles published in their entirety, in the language Portuguese or English. Studies in which prematurity was related to previous genetic malformation or attempted termination of pregnancy were excluded. To select the articles, the titles were first read, and the abstracts were read later, and the articles that contemplated the proposed theme were selected.

3 RESULTS AND DISCUSSION

To face prematurity, it is essential to invest in preventive actions, such as encouraging adequate prenatal care and access to family planning. The early identification of risk factors for preterm birth and the adoption of preventive measures can contribute to reducing preterm birth rates. With the studies analyzed, the main findings will be described and discussed below.

3.1 IMPORTANCE AND IMPACT OF PRENATAL CARE ON MATERNAL AND CHILD HEALTH

The gestational period is a crucial phase in a woman's life, marked by significant physical, emotional and social transformations. During pregnancy, the woman's body undergoes adaptations to house and nurture the developing fetus, while the mind and emotions prepare for the role of mother. Maia *et al*. (2022, p. 02) highlight that "throughout the gestational period metabolic endocrine changes occur, with the purpose of meeting maternal-fetal demands, with the uterine cervix being a prominent element in the preservation of pregnancy."

Pregnancy is a unique and personal experience for every woman. As the baby grows inside the womb, the woman experiences hormonal changes that can affect her mood, energy, and emotional well-being. In addition, she may feel a special and deep connection with the developing baby, developing a maternal bond even before birth. Public health plays a key role in supporting and promoting health during pregnancy. It is the responsibility of governments and health systems to ensure that all women have access to quality antenatal care, regardless of their socioeconomic status or where they live (Leal *et al*., 2020).

One of the main concerns regarding pregnancy and public health is to ensure that women have access to adequate prenatal care from the beginning of pregnancy.

"Prenatal care is a set of actions that are simultaneously preventive, health-promoting, diagnostic and curative, aiming at the good outcome of pregnancy for the woman and her child(ren)" (Leal *et al*., 2020, p. 02). Prenatal care involves a series of examinations and medical consultations that aim to monitor the health of the mother and baby, identify and treat possible complications, as well as provide information and guidance on healthy eating, physical activity, body care and preparation for childbirth (Leal *et al*., 2020).

The adequacy of prenatal care is associated with protective factors against the risk of fetal death and has a direct impact on reducing the incidence of preterm birth and low birth weight. In addition to avoiding complications and benefiting the maternal prognosis. Although the infant mortality rate in 2015 reached the goal of the United Nations Millennium Development Goal, the level is high, and there are still differences in mortality rates in Brazil by region, color and schooling, proving that to this day there are inequalities in the country (Oliveira; Cavalcante Filho, 2021).

3.2 PREMATURITY IN BRAZIL: RISK FACTORS AND REGIONAL CHALLENGES AND INEQUALITIES IN PRENATAL CARE

The United Nations is also concerned with the issue of prematurity, since it is one of the goals stipulated in the Sustainable Development Goals (SDGs), more precisely in goal 3.2 that aims to ensure equitable access to quality antenatal care is essential. This includes regular checkups during pregnancy, screening and management of risk factors such as gestational diabetes and hypertension, and proper follow-up of pregnant women. Thus, it is important to ensure access to specialized neonatology services for premature babies, where they can receive specialized and multidisciplinary care (Gonzaga *et al*., 2016).

Moreover, this objective encourages exclusive breastfeeding, to ensure adequate nutrition and to promote the mental health of pregnant women and their families are important measures in reducing prematurity. Awareness actions about smoking, alcohol and drug consumption also play a crucial role. The sharing of knowledge, best practices and resources can help promote the exchange of information and experiences, contributing to the improvement of care and the reduction of prematurity worldwide (Oliveira, 2023).

According to Fernandes *et al*. (2023, p. 2357), "Brazil showed a decrease in mortality in children under 1 year of age between 2005 and 2019, with a reduction from 51,467 to 35,293 deaths, respectively." The Brazilian Institute of Geography and Statistics (IBGE) presented in 2021 a report that stated that the Southeast region is at the top of the regions with the highest number of deaths,

adding up to a total of 214,600 deaths between 2005 and 2020, followed by the Northeast region with 202,722 deaths and the North region with 79,193 deaths in the same period.

The Ministry of Health, through the National Prenatal and Puerperium Program (PNPP), created in 2006, establishes principles, guidelines and protocols for prenatal care in Brazil. The program encourages the performance of appropriate consultations and examinations, in addition to promoting health education and the active participation of pregnant women in the care of their health and that of the baby. In this sense, the program aims that "obstetric and neonatal care should have as essential characteristics quality and humanization. It is the duty of health services and professionals to welcome women and newborns with dignity, focusing on them as subjects of rights" (Brasil, 2004, p. 09).

One of the main goals of prenatal care is to identify and treat early risk conditions, such as hypertension, gestational diabetes, infections, anemia, among others. During prenatal consultations, clinical, laboratory and imaging tests are performed to monitor the health of the pregnant woman and the fetus. Guidance is also offered on healthy eating, adequate physical activity, correct use of medications and harmful substances, as well as information on the care of the newborn. According to Mendes *et al*. (2020, p. 795), prenatal care includes, "measures that aim to lead to deliveries of healthy newborns, without negative impacts on women's health, with an approach including psychosocial aspects and educational and preventive activities applicable in this process."

In Brazil, prenatal care is offered by both free and private services. In the Unified Health System (SUS), prenatal care is made available free of charge and universally, with the objective of guaranteeing access to all pregnant women, regardless of their socioeconomic status. The preservation and improvement of maternal and child health are some of the objectives defined by the Ministry of Health, and the SUS is responsible for providing prenatal and puerperal care (Tomasi *et al.* 2017). In addition, the Family Health Strategy (FHS) program plays an important role in this care, providing a closer and more integral follow-up, with family health teams working in the communities.

Despite the advances achieved, there are still challenges to be overcome in prenatal care in Brazil. One of them is the guarantee of quality and equity in care, especially in more remote regions and with lower socioeconomic development. To ensure quality and equity of care in these regions, it is necessary to adopt specific strategies and policies that consider their particular needs and challenges. It is essential to invest in the improvement of health infrastructure, ensuring the presence of adequate facilities, modern equipment and resources necessary for quality care. This includes the construction and maintenance of hospitals, clinics and health posts, as well as the availability of efficient transport and communication (Carvalho; Mendes; Amaral, 2019).

It is necessary to ensure the presence of trained health professionals in these regions. This can be achieved through incentive policies such as scholarships, training programs and attracting

professionals to work in these areas. In addition, it is important to promote the education and training of local health professionals in order to strengthen the capacity of the community itself to provide basic health care. It is critical to ensure access to essential medicines and medical technologies in remote regions. This can be done through partnerships with international organizations, pharmaceutical assistance programs, and facilitation of the importation and distribution of medicines. Thus, the use of information and communication technologies, such as telemedicine, can help overcome geographical barriers and provide specialized care at a distance (Tomasi *et al*., 2017).

Promoting health awareness and education is essential to empowering local communities to take care of their own health. This can be done through awareness campaigns, educational lectures, and disease prevention programs. It is also important to adapt health information to the local culture and languages spoken in the region, to ensure that it is understood and assimilated correctly. Establishing monitoring and evaluation systems is crucial to ensuring quality and equity in care. This involves the collection and analysis of data on the region's health indicators, the performance of health services and user satisfaction. Based on this information, gaps can be identified and corrective measures implemented to improve the quality of care (Nascimento *et al*., 2020).

It is also important to expand access to prenatal care for vulnerable groups, such as adolescents, women in situations of social vulnerability and those living in rural areas (Mario *et al*., 2019). Another challenge is the need to strengthen the education and qualification of health professionals involved in prenatal care. It is essential that these professionals are up to date on the best practices and national and international guidelines, ensuring quality care based on scientific evidence (Leal *et al*., 2020).

Lack of access to quality antenatal care can have serious consequences for the health of both mother and baby. Women who do not receive adequate prenatal care have a higher risk of complications during pregnancy and childbirth, such as preeclampsia, preterm birth, and low birth weight. In addition, lack of medical follow-up can result in undetected health problems in the fetus, which can be treated or monitored in advance. In Brazil, the primary health care network plays an important role as the first access door to the care system for pregnant women, being fundamental for the integral care of the mother-child group, which contributes to achieving more positive results in the birth process (Silva *et al.*, 2019).

Another aspect of paramount importance of public health related to pregnancy is the promotion of maternal health. Mental health should also be addressed, as pregnancy can be a period of emotional vulnerability for many women (Martinelli *et al*., 2021). One of the greatest public health challenges regarding maternal infants is prematurity. The World Health Organization (WHO) defines a premature baby as one who is born before completing 37 weeks of gestation. According to gestational age (GA) the newborn can be classified into extreme prematurity (from 22 to less than 28 weeks), severe

prematurity (from 28 to less than 32 weeks) and moderate to late prematurity (from 32 to less than 37 weeks) (Martinelli *et al.*, 2021).

According to Gonzaga *et al.* (2016) Prematurity is one of the leading causes of infant mortality worldwide. It is estimated that about 15 million babies are born prematurely each year, which corresponds to approximately 1 in 10 births. The rate of prematurity varies from country to country, being more prevalent in low- and middle-income countries. Annually, 3.6 million deaths worldwide occur in the neonatal period. Complications of preterm birth are considered direct causes for approximately 29% of these deaths.

The occurrence of prematurity is influenced by a number of factors that can vary from woman to woman. While not all cases have an identifiable cause, there are some known factors that can increase the risk of a premature birth. Because of this, prematurity is a matter of extreme importance on a global scale, representing a priority for Public Health, since it represents the main cause of neonatal deaths and the second leading cause of mortality in children under 5 years of age (Guimarães *et al*., 2017).

There are several reasons why babies can be born prematurely. Some of the risk factors include advanced or very young maternal age, multiple pregnancies, medical complications during pregnancy such as high blood pressure and diabetes, infections during pregnancy, smoking, alcohol and illicit drug consumption, and limited access to adequate prenatal care (Silveira *et al*., 2008).

Some health conditions of the mother can lead to premature birth. For example, problems in the cervix, which is the lower part of the uterus that opens during labor to allow the passage of the baby. Some women have a weaker or shorter cervix, which can lead to premature opening before term (Guimarães *et al*., 2017). This is known as cervical insufficiency and can result in premature birth. Also certain malformations or abnormalities of the uterus can increase the risk of premature birth. For example, the split uterus (didelphic uterus) or the uterus with septum can hinder the proper growth of the baby and lead to premature birth (Araújo *et al*., 2021)

Very young women (under 18) and older women (over 35) are more likely to have premature births. Adolescence and advanced maternal age are associated with a higher risk of complications during pregnancy that can lead to prematurity (Maia *et al.*, 2022). Adolescent girls' bodies are still developing, and early pregnancy can place an additional burden on the reproductive system, which may not be fully prepared to sustain a full pregnancy. As women age, ovarian reserve decreases and the quality of eggs can be affected. This can lead to a higher incidence of complications during pregnancy, including preterm birth (Mendes; Alcantara, 2023).

Women pregnant with twins, triplets or multiples are more likely to have premature births. This is because multiple gestation puts additional pressure on the mother's uterus and body, which can result

in a premature birth. "It is estimated that 1 to 3% of all births are twins, resulting in 10% of all deaths from premature causes" (Evaristo *et al*., 2020, p. 278).

It is important that women with these conditions receive adequate prenatal care to minimize the risks. Women who have had previous preterm births are more likely to have a new preterm birth in subsequent pregnancies. It is essential that these women are closely monitored by health professionals during pregnancy and receive specialized care (Guimaraes *et al.*,2017).

Infectious causes are another factor that contribute to the risk of prematurity, including uterine infections, urinary tract infections, and sexually transmitted infections. Thus, it is important to identify and treat these infections during pregnancy, in order to minimize the risks. Specifically, sexually transmitted infections (STIs), which, among infectious causes, is associated with increased prevalence of undesirable obstetric outcomes when not properly treated (Araújo *et al.,* 2021).

Bacterial infections of the genital tract, such as chlamydia, gonorrhea, and trichomoniasis, have been linked to a higher risk of preterm birth. These infections can ascend from the cervix to the uterus and cause inflammation, which can trigger labor ahead of time (Araújo *et al*., 2021). Also urinary tract infections, such as cystitis or pyelonephritis, are also related to increased risk of preterm birth. When not treated properly, these infections can spread to the uterus and trigger an inflammatory response, leading to preterm labor (Marques *et al*., 2023).

The consequences of premature births can be severe for both the baby and the mother. Premature newborns are more prone to respiratory complications, heart problems, feeding difficulties, delayed neuropsychomotor development, and have a higher risk of developing chronic diseases throughout life. Mothers may suffer from postpartum complications, such as hemorrhages and infections, and face emotional challenges related to the baby's prematurity (Viellas *et al*., 2014).

It is critical that pregnant women receive adequate prenatal care, including regular checkups for early detection of infections, such as syphilis, and preventive measures to reduce the risk of prematurity. Timely treatment of syphilis during pregnancy with appropriate antibiotics can prevent congenital syphilis and its complications. In addition, awareness of these risk factors, both among health professionals and in communities, is essential to prevent and combat prematurity and congenital syphilis (Evaristo *et al.*, 2020).

Stress, lack of social support, during pregnancy can increase the risk of premature birth. It is critical that women receive emotional support, adopt healthy habits, and avoid harmful substances during pregnancy. A short interval between pregnancies (less than 18 months) increases the risk of prematurity. It is recommended that women wait at least 18 months between delivery and the next conception to allow full recovery of the body (Dias *et al.*, 2022).

It is important to emphasize the need for health education for pregnant women and their families, with information on the importance of adequate prenatal care, the recognition of signs of

preterm labor and the adoption of healthy habits during pregnancy. Although Brazil has advanced in the implementation of public policies aimed at prematurity, there are still challenges to be overcome, such as reducing regional inequalities in access to health services and improving the quality of prenatal care throughout the country (Silva *et al.*, 2021).

Through health education, pregnant women can acquire knowledge about the importance of regular prenatal care, adequate monitoring of maternal health, identification of warning signs, and seeking medical assistance when necessary. This contributes to the early detection of complications and the proper management of pre-existing medical conditions, ensuring the health and well-being of the mother. Pregnant women can receive guidance on a balanced diet, with foods rich in essential nutrients, as well as information on the importance of the consumption of prenatal vitamins and the restriction of harmful substances, such as alcohol and tobacco (Costa *et al*., 2023).

3.3 IMPLEMENTATION OF PUBLIC POLICIES FOR THE PREVENTION OF PREMATURITY

Health education helps pregnant women and their families understand the labor process, breathing techniques, comfortable positions, and pain relief techniques. In addition, information is provided on postpartum care, breastfeeding, newborn hygiene, and warning signs that require medical attention. It is in this process that they understand the importance of newborn health care, including proper vaccination, exclusive breastfeeding, proper hygiene, and the prevention of accidental injury. This information empowers families to provide a safe and healthy environment for the baby (Jacauna *et al*., 2023).

Launched in 2011, the Stork Network is a strategy that seeks to ensure access for all women to adequate prenatal care, safe delivery and comprehensive newborn health care. The initiative aims to reduce maternal and infant mortality as well as prematurity (Martinelli *et al*., 2021). The Ministry of Health has promoted the humanization of labor and birth, encouraging practices that respect women's rights and provide a welcoming and safe environment during the process of giving birth. This approach seeks to reduce stress and unnecessary interventions, which may contribute to prematurity (citation).

The Stork Network is based on essential principles, such as the right to reproductive planning, humanized and qualified care, the guarantee of obstetric and neonatal safety, the integrality of care and social participation. These principles guide the organization of health services and the care provided to pregnant women and their babies. The initiative seeks to involve and empower pregnant women, their families and the community in general, encouraging active participation in the definition of health policies and the improvement of the services provided. By strengthening health care from pregnancy to postpartum, the initiative contributes to reducing maternal and infant mortality, ensuring a healthier future for the country's women and children (Santana; Passion; Santos, 2023)

In Brazil, the Unified Health System (SUS) plays a fundamental role in health promotion and prevention of prematurity. However, the Brazilian government's commitment to invest in maternal and child health and in policies to prevent prematurity is essential to ensure the well-being of mothers and babies and reduce prematurity rates in the country (Leal *et al.*, 2020).

One of the public policies aimed at prematurity is the Humanized Care to the Newborn, known as the Kangaroo Method, according to Brasil (2017, p. 13) the "humanization of neonatal care, understood as respect for the integrality and uniqueness of each newborn, not dissociated from the technical-scientific quality and good practices of the field of neonatal intensive care".

These practices have been shown to be effective in improving health outcomes and stimulating the adequate growth of preterm infants. Humanized Newborn Care recognizes the importance of considering the individuality of each baby and offering personalized, family-centered care. This policy highlights the need for a holistic approach that goes beyond clinical treatment and takes into account emotional, affective and social aspects. Through this approach, we seek to provide a welcoming and safe environment for the baby and his family, ensuring them the necessary support during this delicate phase (Mori *et al*., 2017).

Integrating newborn care in the child's public policy agenda can contribute to the reconfiguration of the political and technical performance of childcare in the country, including greater interaction between technical areas and other areas of the Ministry of Health, especially those focused on programs and hospital management. In this context, the presence in the area of neonatologists with academic training and significant national recognition is one of the elements that characterizes and at the same time strengthens the insertion of neonatal care in the priority axis of federal public policies (Brasil, 2017).

Another important achievement in policies for prematurity was the National Policy of Integral Attention to Children's Health (PNAISC), resulting from Ordinance No. 1,130, of August 5, 2015, of the Ministry of Health. It is a set of guidelines and actions of the Brazilian Ministry of Health aimed at the promotion, prevention and health care of children. This policy aims to ensure the full physical, mental and social development of children, ensuring them the right to health and a healthy life (Brasil, 2015).

PNAISC was created based on the understanding that childhood is a crucial phase for human development and that investing in children's health is fundamental to the future of society. It seeks to ensure equitable and comprehensive access to quality health services, from primary care to medium and high complexity. As guidelines, it provides for the encouragement of exclusive breastfeeding until 6 months of age and the continuity of breastfeeding until 2 years or more, as a form of protection and promotion of child health and appreciation of Primary Care as a gateway to the health system, with the

offer of promotion actions, prevention, diagnosis, treatment and rehabilitation, in addition to monitoring child growth and development (Brasil, 2015).

Established through Ordinance GM/MS No. 715, of 2022, the Maternal and Child Care Network (Rami), is a set of integrated services and actions that have as their main objective to promote the health and well-being of pregnant women, parturients, puerperal women, children and their families. In the scope of primary care, Rami works through the Family Health Strategy (FHS) teams and the basic health units (BRASIL, 2022). At this level, prenatal consultations, monitoring of the child's development, immunizations, guidance on breastfeeding, family planning, among other essential care, are performed. In addition, Rami teams also promote health education actions, such as lectures and support groups (Santana; Passion; Santos, 2023).

To address this public health problem, effective measures are implemented. First, it is necessary to invest in promoting universal access to prenatal care, ensuring that all pregnant women receive adequate follow-up from the beginning of pregnancy. Thus, it is essential to strengthen health education, informing the population about the risks of prematurity and the importance of adopting healthy habits during pregnancy.

It is necessary to invest in the training of health professionals, so that they are prepared to deal with cases of prematurity and offer the necessary support to both mother and baby. In addition, it is important to improve the structure of hospitals, ensuring that they are equipped with the appropriate technology and resources to deal with premature births. In addition to actions in the field of health, it is essential that the government promotes public policies aimed at reducing prematurity. This includes family planning measures, actions to combat smoking and alcohol and drug consumption during pregnancy, as well as programs to encourage breastfeeding and adequate care for the newborn (Nascimento *et al*., 2020).

Health professionals should be able to identify risk factors associated with prematurity, such as a history of previous preterm birth, infections, multiple pregnancy, smoking, among others. The training allows them to gain a good understanding of risk factors and know how to evaluate and monitor pregnant women in relation to these factors. Adequate training includes strategies for the prevention and management of common complications in premature infants, such as respiratory problems, infections, feeding difficulties and neurological development (Carvalho; Mendes; Amaral, 2019).

Prematurity is a constantly evolving field, with new medical advances and best practices emerging regularly. Ongoing training is essential to keep healthcare professionals up to date on the latest evidence and care guidelines for premature babies. This includes access to information about innovative therapies, medicines, technologies and therapeutic approaches that can improve outcomes for these babies. This plays a crucial role in the prevention, management and promotion of the healthy

development of these babies, as well as providing adequate support to their families during this challenging phase (Fernandes *et al*., 2023).

4 FINAL CONSIDERATIONS

Prematurity is a public health issue that demands special attention from government policies. Public health policies play an indispensable role in the prevention, treatment and follow-up of cases of prematurity, aiming to ensure the best possible care for neonates and their families.

Neonatal care is essential to promote the healthy development of premature babies, enabling them to overcome initial challenges and achieve a full life. Investments in hospital infrastructure, training of health professionals and access to state-of-the-art medical technologies are fundamental to ensure the quality of care provided.

The complications associated with prematurity are often complex and can have significant impacts on the lives of preterm infants and their families. Sequelae can range from cognitive and motor challenges to long-term health problems. Therefore, it is crucial to develop preventive and interventional strategies, focusing on the early identification and adequate treatment of complications.

Therefore, it is essential that public health policies continue to strengthen perinatal care networks, promoting awareness of the risks of prematurity and the importance of adequate prenatal care. In addition, continued research and the dissemination of knowledge should be encouraged to improve the understanding of risk factors and best practices in the care of premature infants.

The collaboration of the public and private sectors, as well as the participation of communities and health institutions, is necessary to advance in reducing the rates of prematurity and improving the quality of life of premature newborns and their families.

REFERENCES

ARAÚJO, M. A. L., et al. Fatores associados à prematuridade em casos notificados de sífilis congênita. RevSaude Publica. ;55:28. (2021). Disponível em: https://www.scielo.br/j/rsp/a/dh9CqLkRfp5rYgYp7HkW9Nh/?format=pdf&lang=pt. Acesso em: 16 mai. 2023.

BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Ações Programáticas Estratégicas. Área Técnica de Saúde da Mulher. Pré-natal e Puerpério: atenção qualificada e humanizada. Brasília: Ministério da Saúde, 2005.Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/manual_pre_natal_puerperio_3ed.pdf. Acesso em: 30 mai. 2023.

BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Ações Programáticas Estratégicas. Atenção humanizada ao recém-nascido: Método Canguru : manual técnico / Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Ações Programáticas Estratégicas. – 3. ed. – Brasília :Ministério da Saúde, 2017.Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/atencao_humanizada_metodo_canguru_manual_3ed.pdf. Acesso em: 30 mai. 2023.

BRASIL. Portaria GM/MS Nº 715, de 4 de abril de 2022. Altera a Portaria de Consolidação GM/MS nº 3, de 28 de setembro de 2017, para instituir a Rede de Atenção Materna e Infantil (Rami).Disponível em: https://in.gov.br/en/web/dou/-/portaria-gm/ms-n-715-de-4-de-abril-de-2022-391070559. Acesso em: 30 mai. 2023.

BRASIL. Portaria nº 1.130, de 5 de agosto de 2015. Institui a Política Nacional de Atenção Integral à Saúde da Criança (PNAISC) no âmbito do Sistema Único de Saúde (SUS). Ministério da Saúde. Disponível em: https://bvsms.saude.gov.br/bvs/saudelegis/gm/2015/prt1130_05_08_2015.html. Acesso em: 30 mai. 2023.

BRUM, C.N. et al. Revisão narrativa de literatura: aspectos conceituais e metodológicos na construçãodo conhecimento da enfermagem. In: LACERDA, M.R.; COSTENARO, R.G.S. (Orgs). Metodologiasda pesquisa para aenfermagem e saúde: da teoria à prática. Porto Alegre: Moriá, 2015.

CARVALHO, L. R., MENDES, P. S., AMARAL, P. V. M. Programa saúde da família: a evolução da distribuição espacial das equipes e dos médicos especialistas no Brasil entre 2007 e 2017. Revista da Rede APS 2019. Disponível em: https://apsemrevista.org/aps/article/view/19/3. Acesso em: 30 mai. 2023.

COSTA, M. G., et al. Inclusão de homens em serviços de saúde e atividades educativas: percepção dos pais. Rev Gaúcha Enferm. 2023;44:e20220047 1.
Disponível em: https://www.scielo.br/j/rgenf/a/NzRPbrtC3nR3d8TF3qWvnJs/?format=pdf&lang=pt. Acesso em: 30 mai. 2023.

DIAS, B. A. S., et al. Prematuridade recorrente: dados do estudo “Nascer no Brasil”. RevSaudePublica;56:7(2022). Disponível em: https://www.scielo.br/j/rsp/a/VWnNhHJjhjrn6LffrdRb9wR/?format=pdf&lang=pt. Acesso em: 16 mai. 2023.

EVARISTO, L. R. F., et al. Assistência de enfermagem aos cuidados com recém-nascidos gemelares prematuros: um relato de experiência. 10.37885/200901333 (2020). Disponível em: https://downloads.editoracientifica.com.br/articles/200901333.pdf. Acesso em: 16 mai. 2023.

FERNANDES, M. M. C. E., et al. Fatores que influenciam amortalidade infantil. Arquivos de Ciências da Saúde da UNIPAR, Umuarama, v.27, n.6, p. 2353-2364, 2023.Disponível em: https://ojs.revistasunipar.com.br/index.php/saude/article/view/10101/4807. Acesso em: 16 mai. 2023.

GONZAGA, I. C. A., et al.Atenção pré-natal e fatores de risco associados à prematuridade e baixo peso ao nascer em capital do nordeste brasileiro. Ciência & Saúde Coletiva, 21(6):1965-1974 (2016). Disponível em: https://www.scielosp.org/article/ssm/content/raw/?resource_ssm_path=/media/assets/csc/v21n6/1413-8123-csc-21-06-1965.pdf. Acesso em: 16 mai. 2023.

GUIMARÃES, E. A. A., et al. Prevalência e fatores associados à prematuridade em Divinópolis, Minas Gerais, 2008-2011: análise do Sistema de Informações sobre Nascidos Vivos. Epidemiol. Serv. Saude, Brasília, 26(1):91-98 (2017). Disponível em: https://www.scielosp.org/pdf/ress/2017.v26n1/91-98/pt. Acesso em: 16 mai. 2023.

JACAUNA, V. K. M., et al. Educação em saúde: conhecendo práticas realizadas no pré-natal paraprevenção dos distúrbios hipertensivos na gestação. Revista Eletrônica Acervo Saúde, 2023. Disponível em: https://acervomais.com.br/index.php/saude/article/view/11750/6950. Acesso em: 16 mai. 2023.

KLOSSOSWSKI, D. G., et al. Assistência integral ao recém-nascido prematuro: implicações das práticas e da política pública. Rev. CEFAC. Jan-Fev; 18(1):137-150 (2016). Disponível em: https://www.scielo.br/j/rcefac/a/LkYmzcBfHM8zxWZVvxXC7Qf/?format=pdf&lang=pt. Acesso em: 16 mai. 2023.

LEAL, M. C., et al. Assistência pré-natal na rede pública do Brasil. RevSaudePublica;54:8. (2020). Disponível em: https://www.scielosp.org/pdf/rsp/2020.v54/08/pt. Acesso em: 16 mai. 2023.

LIMA,P. A. P., BARBALHO,E. V. Evidências científicas sobre a política nacional de atenção à saúde da criança.Revista Pesquisa em Fisioterapia. 2015 Ago;5(2):134-142. Disponível em: https://journals.bahiana.edu.br/index.php/fisioterapia/article/view/506. Acesso em: 30 mai. 2023.

MAIA, A. A. A., et al. Fatores de risco da prematuridade: uma revisão narrativa. Revista Eletrônica Acervo Saúde | ISSN 2178-2091 (2022). Disponível em: https://acervomais.com.br/index.php/saude/article/view/9711/5901. Acesso em: 16 mai. 2023.

MARIO,D. N., et al. Qualidade do Pré-Natal no Brasil: Pesquisa Nacional de Saúde 2013. Ciência & Saúde Coletiva, 24(3):1223-1232, 2019. Disponível em: https://www.scielo.br/j/csc/a/d46t6kHLtRQrpjK3GqtdGnH/?format=pdf&lang=pt. Acesso em: 30 mai. 2023.

MARQUES, B. O. B., et al. As consequências da infecção do trato urinário durante o período gestacional. Revista Eletrônica Acervo Saúde, 2023. Disponível em: https://acervomais.com.br/index.php/saude/article/view/11387/6962. Acesso em: 30 mai. 2023.

MARTINELLI, K. G., et al. Prematuridade no Brasil entre 2012 e 2019: dados do Sistema de Informações sobre Nascidos Vivos. R. bras. Est. Pop., v.38, 1-15, e0173 (2021). Disponível em: https://www.scielo.br/j/rbepop/a/6L36BD8CVYczcXZ63gs7Cdj/?format=pdf&lang=pt. Acesso em: 16 mai. 2023.

MENDES, M. S., ALCÂNTARA, S. B. C. Prematuridade extrema: relato de caso. Rev Med UNC (ISSNe: 2764-9687) v. 2, p. 42-53, 2023.Disponível em:

http://www.periodicos.unc.br/index.php/revmedunc/article/view/4794/1993. Acesso em: 16 mai. 2023.

MENDES,R. B., et al. Avaliação da qualidade do pré-natal a partir das recomendações do Programa de Humanização no Pré-natal e Nascimento. Ciência & Saúde Coletiva, 25(3):793-804, 2020. Disponível em: https://www.scielosp.org/pdf/csc/2020.v25n3/793-804/pt. Acesso em: 30 mai. 2023.

MORI, A. S., *et al*. Método canguru na atenção humanizada ao recém-nascido. Revista Educação em Saúde: V5, suplemento 1,2017. Disponível em: http://revistas2.unievangelica.edu.br/index.php/educacaoemsaude/article/view/2350/2013. Acesso em: 30 mai. 2023.

NASCIMENTO, L. C., et al. O SUS na vida dos brasileiros: assistência, acessibilidade e equidade no cotidiano de usuários da Atenção Primária à Saúde. Physis: Revista de Saúde Coletiva, Rio de Janeiro, v. 30(3), e300330, 2020. Disponível em: https://www.scielo.br/j/physis/a/r9tvGTGK8y5QnHMhqrQgWYr/?format=pdf&lang=pt. Acesso em: 30 mai. 2023.

OLIVEIRA, L. C. A. Complicações no desenvolvimento motor, cognitivo e de linguagem em recém-nascidos prematuros: saúde baseada em evidência. Orientador: Nilba Lima de Souza. 2023. 60f. Dissertação (Mestrado em Enfermagem) - Centro de Ciências da Saúde, Universidade Federal do Rio Grande do Norte, Natal, 2023.Disponível em: https://repositorio.ufrn.br/bitstream/123456789/52073/1/Complicacoesdesenvolvimentomotor_Oliveira_2023.pdf. Acesso em: 16 mai. 2023.

OLIVEIRA,J. S., CAVALCANTE FILHO,J. B.Avaliação da atenção pré-natal na rede básica de saúde em Sergipe - programa nacional de melhoria do acesso e da qualidade da atenção básica (PMAQ-AB). Rev. Rede cuid. saúde v. 15, n. 1 jul (2021). Disponível em: http://publicacoes.unigranrio.edu.br/index.php/rcs/article/view/5750/3451. Acesso em: 30 mai. 2023.

SANTANA,M. C. S., PAIXÃO,G. P. N., SANTOS,L. M. Rede Cegonha e Rede de Atenção Materno e Infantil - RAMI: Um estudo reflexivo. Ciências da saúde: estudos e pesquisas avançadas V.01, 2023. Disponível em: http://sevenpublicacoes.com.br/index.php/editora/article/view/724/823. Acesso em: 30 mai. 2023.

SILVA, E. P., et al.Avaliação do pré-natal na atenção primária no Nordeste do Brasil: fatores associados à sua adequação. RevSaude Publica53:43. 2019. Disponível em: https://www.scielo.br/j/rsp/a/fBd9wHZBdZYpsZbg6Qg8nLb/?format=pdf&lang=pt. Acesso em: 16 mai. 2023.

SILVA, R. M. M., et al. Seguimento da saúde da criança e prematuridade: as repercussões dapandemia da Covid-19. Rev. Latino-Am. Enfermagem;29:e3414 (2021). Disponível em: https://www.scielo.br/j/rlae/a/YzHWpT7gHs6R76p8FFdZ4PS/?format=pdf&lang=pt. Acesso em: 16 mai. 2023.

SILVEIRA, M. F., et al. Aumento da prematuridade no Brasil: revisão de estudos de base populacional. Rev Saúde Pública;42(5):957-64 (2008). Disponível em: https://www.scielo.br/j/rsp/a/NXMtnCMzLcfpy7HhHKCg4gR/?format=pdf&lang=pt. Acesso em: 16 mai. 2023.

TOMASI.E., et al.Qualidade da atenção pré-natal na rede básica de saúde do Brasil: indicadores e desigualdades sociais. Cad. Saúde Pública 2017; 33(3):e00195815. Disponível em:

https://www.scielo.br/j/csp/a/Ltr3JY8CdWTkbxmhTTFJsNm/?format=pdf&lang=pt. Acesso em: 30 mai. 2023.

VIELLAS, E. F., et al.Assistência pré-natal no Brasil. Cad. Saúde Pública, Rio de Janeiro, 30 Sup:S85-S100, 2014. Disponível em: https://www.scielo.br/j/csp/a/CGMbDPr4FL5qYQCpPKSVQpC/?format=pdf&lang=pt. Acessoem: 30 mai. 2023.

SEVEN publicações acadêmicas

The incorrect folding of proteins and their involvement with pathological processes

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ABSTRACT
During synthesis and the period in which they exert their cellular function, there is monitoring so that the proteins maintain a certain three-dimensional folding, where their energy levels are stabilized and their biological activity is maintained. Changes in cellular conditions can modify this structure, favoring its aggregation into insoluble complexes, called amyloidosis, depositing in the intra or extracellular environment. Recent data indicate that several types of proteins are involved in some type of amyloidosis, presenting a systemic character, or depositing in a specific tissue. The classification used for these cases considers the amyloid source, the pathology, and the organ affected. Protein fragments derived from immunoglobulin light and heavy chains are responsible for primary systemic amyloidosis. In secondary amyloidosis, there is the participation of circulating plasma protein, acting in inflammatory processes in different organs. Dialysis-related amyloidosis, on the other hand, is characterized by damage to bone tissues and joints in patients with chronic kidney disease. Most studies related to localized amyloidosis involve neurodegenerative diseases such as Alzheimer's and Parkinson's diseases. These heterogeneous pathologies associated with the incorrect folding of proteins are subject to genetic influence, which is increasingly evidenced, despite their multifactorial character. Deficiencies in the cellular proteostasis processes, i.e., in the surveillance that confers the quality control of these proteins, leading to their recovery or sending them for recycling, tend to increase with age. For this reason, most of the time these amyloidoses are related to the individual's aging processes.

Keywords: Protein aggregates, Proteostasis, Chaperone, Proteosome.

1 INTRODUCTION

1.1 PROTEIN STRUCTURE

Proteins are macromolecules that perform several important functions in all living beings, being fundamental structural components, as well as participating in dynamic functional activities, both intra and extracellular. To perform their function, proteins, which are made up of long polypeptide chains, need to be coiled together into a regular functional three-dimensional structure. The folding of these

chains has a multidimensional nature, where different configurations can be defined by the minimum state of free energy of Gibbs, that is, the proteins fold in such a way as to decrease the free energy, reaching their functional native form (PANAHI, 2019). During their existence, proteins can adopt different conformational states in the environment, from their synthesis in ribosomes, through post-translational modifications in specialized cellular compartments, acquiring a functional native architecture, to their destruction for recycling by proteases, when they lose their original shape and, therefore, no longer have a biological function. In terms of three-dimensional structuring, the configurations presented by these biopolymers involve a highly complex equilibrium, defined thermodynamically and kinetically by their primary sequence (number and composition of amino acids) and by specialized tutor enzymes that direct these interactions (chaperones). When native structural characteristics are not maintained, complexes responsible for final quality control eliminate non-functional protein forms. Although the primary level of these proteins has co-evolved according to the type of environment in which they act in their soluble states, certain conditions can alter protein configurations, converting them into non-functional insoluble aggregates that are potentially harmful to the environment where they are deposited (CHITI; DOBSON, 2017).

1.2 PROTEIN AGGREGATES

Amyloidosis is a pathology associated with the deposition of protein fibrils found in several vertebrate species. The incorrect folding of excess proteins can potentially be related to pathologies by several mechanisms, including loss of biological function, gain of toxic function or by the entrapment of other misfolded proteins, disfavoring their recovery or recycling. The agglomeration of these proteins with a secondary β-pleated, cross-the-leaf configuration and insoluble is an intrinsic feature of amyloid diseases (KARUNARATHNE, *et al.* 2023).

The name amyloid means similar to starch (Greek: amylon or Latin: amylun), and was used for the first time in 1854 by Rudolf Virchow to define regions of tissues that presented a histological stain similar to starch, when stained with the mixture of iodine-sulfuric acid (KYLE, 2001). The development of more well-defined methodologies, using dyes such as Congo red and polarization microscopy, showed that these observed extracellular deposits were not starch, a reserve polysaccharide found in vegetables, but rather proteins. Based on this finding, it was observed that these deposits could occur in several different tissues and organs, and that in many cases they are associated with specific pathologies (BENSON, *et al.* 2019).

Amyloid formation involves a series of protein aggregation events, leading to the generation of mature insoluble fibrils that accumulate in different types of tissues in the body. In addition to the formation of insoluble fibrils, soluble oligomeric species can also be generated, which constitute the most cytotoxic molecular forms produced during the amyloid cascade. The direct or indirect action of

these soluble oligomers seems to be involved with cell death, and in some cases with the functional alteration of a given organ (ALMEIDA; BRITO, 2022).

Current data indicate that at least 36 different proteins have already been identified as participants in amyloidogenic processes in humans, with 19 of these proteins being deposited in some specific organ (localized amyloidosis), at least 14 types of proteins and their variant forms appear to be distributed throughout various parts of the body (systemic amyloidosis), and at least 3 types of proteins can promote localized or systemic deposits. These last three groups involve fragments derived from the light chain, heavy chain of immunoglobulin and β2 microglobulin, a protein present in almost all cells and found in the blood in some types of cancer (PICKEN, 2020; PEDRO, *et al.* 2019, BENSON, et al. *2019, MUCHTAR,* et al. 2021).

Early studies linked these protein deposits to neurodegenerative disorders, such as Alzheimer's, Parkinson's and spongiform encephalopathy. However, it was found that extracerebral amyloidosis is also important, since its incidence is relatively common in processes involving cellular and individual aging. Virtually all elderly humans have amyloid deposits at some point, and they are often associated with the cardiovascular system, and they can also be associated with important chronic diseases, such as type 2 diabetes mellitus and rheumatoid arthritis (WESTERMARK, 2015).

These protein aggregations present themselves in various ways, being related to processes that lead to heart failure due to ventricular hypertrophy, hepatomegaly, nephrotic syndrome, macroglossia, hypoorthostatic hypotension, ecchymosis, autonomic and peripheral neuropathy, carpal tunnel syndrome, lameness of the mandible and joint deposits. Secondary amyloidosis may involve hepatosplenomegaly, proteinuria, renal failure, and orthostasis. Beta amyloidosis in the nervous system presents as Alzheimer's disease (BHUSHAN, 2021).

The cytotoxicity of these amyloidogenic proteins correlates with their size and external exposure of their hydrophobic sites, which in the native configuration are located inside the protein. Exposure to these hydrophobic nuclei is potentially harmful, as they interact with other nonpolar surfaces in cellular compartments and can interfere with a wide spectrum of biological processes (ARGHAVANI, *et al.* 2022). The mechanism of toxicity is not yet fully understood, but it is possible that the oligomerization of these proteins would play a central role in inducing cell damage. Evidence for this comes from the characterization of these oligomers, since these hydrophobic groups exposed on the surface seem to be a determining factor in interactions with the phospholipid bilayer of cell membranes, binding to different protein receptors and other cellular components. Interactions can result in decreased receptor activity, increased membrane permeability, formation of pore-like structures, altering ionic homeostasis (PANAHI, 2019).

Strategies to combat amyloidogenesis and related toxicity include the use of drugs consisting of small molecules capable of inhibiting amyloid aggregation, or that are capable of stimulating the

degradation of these fibrils by proteosomes and autophagy, or that promote the disaggregation of toxic amyloid fibers or soluble oligomers (CHUANG, *et al,* 2018).

1.3 CHAPERONES

During the production process, chaperones prevent aggregation and promote the efficient folding of proteins by cells, contributing to the maintenance of proteome homeostasis. (ALMEIDA; BRITO, 2022). Chaperones are part of a group of proteins that have their synthesis increased under conditions of cellular stress. Originally known as Heat Shock Proteins (HSP), they promote cellular defense against the formation of amyloid fibrils, employing strategies that prevent the aggregation of the set of cellular proteins, favoring the correct folding and recovery of misfolded proteins from transient interactions. Chaperones prevent the conversion of native proteins into amyloids (WENTINK, *et al* 2019).

When this quality control system is disrupted, the polypeptides proceed to incorrect folding, inactivity, and aggregation. In addition to chaperones, there are other proteins that disaggregate protein tangles at the expense of ATP, showing a co-chaperone activity (DOYLE, *et al*. 2013). Probably several native conformations in the proteins are possible from the activity exerted by the chaperone, and these configurations can lead the same polypeptide chain to present different functions. The chaperone is capable of distinguishing the functional structures of proteins, recognizing and acting on those that are misfolded and neglecting those that have the native configuration (MURONETZ, *et al.* 2022).

Laboratory assays using yeast models have shown that even small changes in the homeostasis of the folding of an amyloidogenic protein can lead to a gain in proteotoxic function and that the cytoprotective function is dependent on the action of chaperones (DOUGLAS, *et al*. 2008). There are also groups of non-protein chaperones, which are small molecules capable of stabilizing the native state or disaggregating the misfolded state of amyloid chains. The chemical chaperones that most participate in protein recovery are hydrophobic compounds, such as bile acids, steroid hormones, and osmolytes such as some carbohydrates, polyols, glycerin, and methylamines (ALMEIDA; BRITO, 2022).

Studies carried out by WYatt et al. showed the role of extracellular chaperones in amyloidosis. In this review article, the authors suggest that these chaperones play a central role in proteostasis, participating in the patrolling of extracellular biological fluids, looking for misfolded proteins, facilitating their clearance via endocytic receptors. The interruption or overload of this extracellular proteostasis would lead to the increase of these amyloidogenic proteins with consequent formation of extracellular aggregates and pathology (WYATT, 2012).

1.4 PROTEOSOME

The ubiquitin-proteosome system (UPS) is a multicatalytic complex of proteases responsible for the renewal of most cellular proteins. They have a ring structure with a narrow pore that selectively degrades target proteins into peptide fragments (TÜRKER, *et al.* 2021). UPS is the main pathway for the degradation of misfolded, unnecessary, or damaged intracellular proteins. When their effectiveness decreases, these proteins aggregate in the medium, which can block normal functions, even leading to cell death. The maintenance of proteostasis is important for neurons, due to their complex architecture and inability to dilute the accumulated load since they no longer enter the process of cell division (THIBAUDEAU, *et al.* 2018).

Experimental results obtained by Chocron and collaborators demonstrated that proteosome dysfunction in animal models is a prominent marker of early stage Alzheimer's disease. Induction of appropriate proteosome assembly was able to reduce protein aggregation in cell culture, drosophila, and transgenic mice. They also observed that proteosome agonists derived from the TAT peptide reduced deficits in animal models of Alzheimer's. The protective effects found showed an increase in the turnover of the Amyloid Precursor Protein and a reduction in the levels of the peptide Aβ42, responsible for this amyloidosis (CHOCRON, *et al.* 2022).

2 TYPES OF AMYLOIDOSIS

Several classification systems have been developed to indicate the different types of amyloidosis, and currently, in medical practice, it is based on the type of protein involved. The recommended nomenclature uses the letter A to name the word amyloid, followed by the abbreviation that defines the protein type. Systemic amyloidosis of the AL (Amyloid derived from the immunoglobulin light chain), AA (Amyloid derived from Apoprotein), ATTR (Amyloid derived from Transthyretin), as well as localized amyloidosis (LARREA, *et al.*, 2015; PICKEN, 2020). They can also be classified according to the etiology presented as systemic, hereditary, central nervous system, ocular or located in certain organs. However, the definitions of the most common types found in the literature are AL, AA, ATTR, and amyloid dialysis-related type β2M (BUSTAMANTE, ZAIDI, 2023, REAL de ASÚA, *et al.* 2014).

The population prevalence of these amyloidosis varies between different regions of the world. In more affluent countries, the primary (AL) and transthyretin (ATTR) types are the most frequent types found in cases of systemic amyloidosis. On the other hand, in resource-limited countries, secondary amyloidosis (AA) is more prevalent. This variation probably results from a higher burden of chronic infectious diseases such as tuberculosis, leprosy, and osteomyelitis as observed in poorer countries and regions (WESTERMARK, *et al*., 2008).

2.1 PRIMARY AMYLOIDOSIS (AL)

AL (or primary) amyloidosis is the most common form of the disease. It starts in the bone marrow, where red and white blood cells are formed. One type of lymphocyte, called a plasma cell, is a producer of immunoglobulin (antibody), a complex defense protein composed of light and heavy chain units. Plasma cells are differentiated B lymphocytes that play a significant role in the humoral adaptive immune response (ALLEN, SHARMA, 2023). Physiologically, plasma cells release complete antibodies, and the body breaks down these proteins and recycles them after a short period. However, in LA, many unassembled and incorrectly bent light chains are generated, which cannot be broken down effectively. They bind together to form amyloid fibrils that accumulate in the extracellular space of organs and tissues, impairing the normal functioning of the body. Manifestations usually arise in the kidney, heart, liver, spleen, nerves, intestines, skin, tongue, and blood vessels (AMYLOIDOSIS SUPPORT GROUP, 2023).

The symptoms of AL amyloidosis are different in each patient, depending on which organ is affected. The most common symptoms are fatigue, weight loss, and bloating. Chronic kidney disease is common in patients with AL amyloidosis, where amyloid deposits in the kidneys affect their way of filtering toxins and proteins from the blood, leading to nephrotic syndrome (AMYLOIDOSIS FOUNDATION, 2023). It is estimated that 75% of patients with AL amyloidosis have proteinuria, often accompanied by edema of the lower limbs (PALLADINI, MERLINI, 2009).

Cardiac involvement is observed in approximately 60% of patients, and these amyloid deposits make the heart muscle thicker and stiffer, typically characterized by thickening of the interventricular septum and ventricular wall, altering its functionality, resulting in fatigue and possible changes in the cardiac electrical system, which can lead to an arrhythmia. (AMYLOIDOSIS FOUNDATION, 2023). Other manifestations that may occur include sudden death or syncope due to arrhythmia or heart block and, rarely, angina or infarction due to amyloid buildup in the coronary arteries.

In approximately one-third of cases of systemic amyloidosis, cardiac clinical manifestations are usually characterized by congestive heart failure due to restrictive cardiomyopathy, cardiomegaly, systolic dysfunction, postural hypotension, and arrhythmias. Gastrointestinal clinical manifestations include obstruction, ulceration, malabsorption, hemorrhage, protein loss, and diarrhea, and may infiltrate the tongue, esophagus, and intestine, causing digestive bleeding (MONTEIRO, DIZ, 2015).

In the nervous system, amyloid deposits can affect the nerves of the hands, feet and legs, causing pain, numbness and tingling, in addition to loss of sensitivity to temperature, called peripheral neuropathy. Nerves that control blood pressure, heart rate, intestinal motility, and other body functions can also be affected, called autonomic neuropathy. (AMYLOIDOSIS FOUNDATION, 2023).

2.2 SECONDARY AMYLOIDOSIS (AA)

Amyloid A (AA or secondary) amyloidosis, also known as serum amyloidosis, arises through an inflammatory disease or chronic infection, resulting from increased levels of circulating amyloid A protein. AA deposits are formed by fragments of the N-terminal portion of the amyloid A acute phase reactant protein, a polymorphic apolipoprotein component of High Density Lipoprotein (LDL) that is stimulated by the inflammatory process, and can reach continuously high plasma concentrations between 100 and 1000 mg/L (OBICI, et al. 2005). Patients who have this condition for six months or more are at risk of AA. These conditions include rheumatic disease, inflammatory bowel disease, tuberculosis, osteomyelitis, lupus, and hereditary fever syndromes, such as familial Mediterranean fever. Amyloid deposition usually begins in the kidneys, but the liver, spleen, lymph nodes, and intestine are also commonly affected. (AMYLOIDOSIS SUPPORT GROUP, 2023). It can lead to multi-organ dysfunction, including alteration in glomerular filtration rate and proteinuria (THORNE, *et al.* 2022). During the inflammatory process, some signaling cytokines are released, such as interleukin 1 (IL-1), interleukin 6 (IL-6), and tumor necrosis factor (TNF), which activate the hepatic synthesis of serum amyloid A, the precursor of AA fibrils. Therefore, effective treatment of the underlying inflammatory disorder blocks the stimulus for precursor synthesis. (XAVIER, 2008).

Nephropathy associated with AA amyloidosis presents as proteinuria and renal failure. The purpose of therapy is to interfere with the production of the precursor protein and prevent the formation of additional fibrils. Decreased production of serum amyloid A protein is associated with improved renal function, stabilization or regression of amyloid deposits. (COSTA, 2010). Management of renal AA amyloidosis is focused on treating the inflammatory condition to stabilize glomerular filtration rate, reduce proteinuria, and slow progression to renal failure (THORNE, *et al.* 2022).

2.3 FAMILIAL AMYLOIDOSIS (HEREDITARY)

Familial (or hereditary) amyloidosis is associated with the mutant transthyretin (TTR) protein produced in the liver. TTR is a protein that helps transport thyroxine (a thyroid hormone) and retinol (vitamin A) around the body. The peripheral nervous system (somatic and autonomic) and heart are the most affected sites, therefore, peripheral sensorimotor neuropathy, dysautonomia, and cardiomyopathy, often in combination, are the common phenotypes (MANGANELLI, *et al*., 2022). Symptoms occur in middle age and old age. When the nerves are initially affected, the clinical picture is known as familial amyloid polyneuropathy; If the heart is affected first, it is called familial amyloid cardiomyopathy. In addition to peripheral and autonomic neuropathy and heart disease, ATTR can lead to vitreous opacity. Familial ATTR is a disease that begins with symptoms of paresthesias of the lower limbs, followed by a progressive deterioration of gait, erectile dysfunction, urinary incontinence and gastrointestinal involvement, with death within 10 years, when treatment is not instituted.

Transthyretin plays a central role in three pathologies characterised by TTR deposition in the form of amyloid: a sporadic disease in which transthyretin is exclusively native (wild-type wt-TTR), systemic senile amyloidosis (SSA) and two familial diseases in which a mutation of the TTR gene occurs, familial amyloid cardiomyopathy (FAC) and familial amyloid polyneuropathy (FAP). (SEIXAS, 2016).

The deposited protein is a mutated form of transthyretin, where more than a hundred different forms have been described. The most common TTR mutation is called Val-30-Met, which causes nerve damage and electrical problems in the heart. (AMYLOIDOSIS SUPPORT GROUP, 2023). These amyloidogenic variants are thermodynamically less stable, resulting in the dissociation of tetramers into monomers, and these units have a greater propensity to aggregate into fibrils (BUSTAMANTE, ZAIDI, 2023).

2.4 DIALYSIS-RELATED AMYLOIDOSIS TYPE β2M

Dialysis-related amyloidosis (ARD) is a debilitating pathology that is characterized by the accumulation and deposition of amyloid fibrils composed of beta2-microglobulin (β2-M) in bone tissues, periarticular structures, and internal organs of individuals who have suffered from chronic kidney disease (CKD) and are approved for dialysis treatment (HEEGGARD, 2009). β2-M is a constituent of the major histocompatibility complex (MHC) of cell membranes that is usually removed through glomerular filtration, followed by reabsorption and catabolism in the proximal tubules. In patients with reduced renal function, β2-M clearance decreased, increasing its plasma flow and gradual deposition in tissues. The most common symptoms related to patients with ARD are shoulder pain related to scapular periarthritis and amyloid rotator cuff infiltration, and symptoms of carpal tunnel syndrome, which is a very common manifestation in these patients (ZEGRI-REIRIZ, *et al,* 2019, DONNELLY, *et al.* 2019).

Table 1 - Classification of amyloidosis, source from which the protein is derived, and which organs are affected by amyloid deposition.

Category	Source of amyloid	Syndrome	Affected organs
Primary amyloidosis, AL	Plasma cells in the bone marrow (immunoglobulin light or heavy chains).	Primary or associated myeloma.	Kidneys, heart, liver, spleen, nerves, gastrointestinal tract, skin, tongue, and blood vessels.
Secondary amyloidosis, AA, or serum amyloidosis	Circulating inflammatory protein (Serum amyloid A).	Reactive, secondary to chronic inflammation or infections.	Kidneys, liver, spleen, lymph nodes, and intestine.
Familial amyloidosis, ATTR	A mutant, wild-type protein formed in the liver.	Hereditary and senile.	Heart, which can cause familial amyloid cardiomyopathy and familial amyloid polyneuropathy
Dialysis-related amyloidosis, DRA	Circulating serum protein, β2-M.	Associated with dialysis.	Bone tissues, periarticular structures, and internal organs of individuals who have

			suffered from chronic kidney disease.

3 FINAL CONSIDERATIONS

Amyloidosis consists of a rare and heterogeneous group of alterations characterized by misfolded proteins, where groups of nonpolar amino acids are exposed, favoring the association of these components in insoluble aggregates, deposited in the intra or extracellular environment, leading to organ damage. Many of these amyloidosis are related to the individual's aging processes, and literature review studies have indicated the participation of more than 10 different types of proteins involved (PICKEN, M.M., 2020). Among the most studied proteins, amyloid beta (Aβ42), alpha synuclein, transthyretin, islet amyloid polypeptide, atrial natriuretic factor, and fibulin-like matrix protein are among the most studied proteins. Most studies have always focused on neuronal amyloidosis (TASAKI, M *et al.* 2021). Although the aging process is related to amyloid deposits, studies reveal that cognitive aging, in general, is a multifactorial process (PRASAD, K. 2019).

Cellular proteostasis involves the quality control of the newly synthesized protein and those active proteins that act to perform their function. Autophagy, mediated or not by chaperones, is a surveillance process that contributes to the quality control and recycling of these denatured proteins. The decrease in surveillance capacity is proportionally associated with increasing age and, consequently, with the incidence of neurodegenerative diseases, such as Alzheimer's and Parkinson's disease, associated with the accumulation of protein aggregates in the brain in these patients (BOURDENX, M, *et al*. 2021).

REFERENCES

ALLEN, H.C., SHARMA, P. Histology, Plasma Cells. Treasure Island (FL): StatPearls Publishing; 2023.Citado em: 08/07/2023.
https://www.ncbi.nlm.nih.gov/books/NBK556082/

ALMEIDA, Z.L.; BRITO, R.M.M. Amyloid Disassembly: What cam we learn from Chaperones? Biomedicines, 10(12), 3276, 2022.
https:doi.org/10.3390/biomedicines10123276

AMILOIDOSIS SUPPORT GROUPS. Amyloidosis Awareness for patients and their support network, including physicians, nurses and medical students. 2nd edition. Citado em 08/07/2023. https://www.amyloidosissupport.org/AmyloidAware_Booklet.pdf

AMYLOIDOSIS FOUNDATION. Webinar Update in ATTR, Cardiac & Neurolgical Amyloidosis. Citado em 08/07/2023.
https://www.amyloidosis.org/facts/al#symptoms

ARGHAVANI, P., PIRHAGHI, M., MOOSAVI-MOVAHEDI, F., MAMASHLI, F., HOSSEINI, E, MOOSAVI-MOVAHEDI, A.A. Amyloid management by chaperones: The Mystery underlying protein oligomers dual functions. Current Research in structural Biology. Vol. 4 pag 356-364. 2022. https://doi.org/10.1016/j.crstbi.2022.11.002

BENSON, M.D., BUXBAUM, J.N., EISENBERG, D.S., MERLINI, G. SARAIVA, M.J.M., SEKIIMA, Y. SIPE, J.D., WESTERMARK, P. Amyloid nomenclature 2018: recommendations by the International Society of Amyloidosis (ISA) nomenclature committee. Amyloid, 25:4, 215-219. 2019.
https://doi.org/10.1080/13506129.2018.1549825

BHUSHAN, M. Amyloidosis-A Mini Review. J Clin Res Bioeth. Vol.12 Iss.6 No:1000p055. 2021. Citado em 08/07/2023.
https://www.walshmedicalmedia.com/open-access/amyloidosisa-mini-review.pdf

BOURDENX, M., GAVATHIOTIS, E., CUERVO, A.M. Chaperone-mediated autophagy: a gatekeeper of neuronal proteostasis. Autophagy, Informa UK Limited, trading as Taylor & Francis Group, vol. 17, nº 8, 2040-2042.
https://doi.org/10.1080/15548627.2021.1935007

BUSTAMANTE, G., ZAIDI S.R.H. Amyloidosis. 2023Feb 11. In: Stat Pearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023. Citado em 08/07/2023.
https://pubmed.ncbi.nlm.nih.gov/29261990/

CASCELLA, R., BIGI, A., CREMADES, N., CECCHI, C. Effects of oligomer toxicity, fibril toxicity and fibril spreading in synucleinopathies. Cell. Mol. Life Sci. 79, 174. 2022.
https://doi.org/10.1007/s00018-022-04166-9

CHITI, F, DOBSON, C.M. Protein Misfolding, Amyloid Formation, and Human Disease: A Summary of Progress Over the Last Decade. Annu. Rev. Biochem. 2017. 86:27–68.
https://doi.org/doi/10.1146

CHOCRON, E.S. *et al.* Genetic and phsrmacologic proteasome augmentation ameliorates Alzheimer's-like pathology in mouse and fly APP overexpression models. Scienceadvences, vol 8, no 23. 2022.
DOI: 10.1126/sciadv.abk2252

CHUANG, E., HORI, A.M., HESKETH, C.D., SHORTER, J. Amyloid assembly and disassembly. J Cell Sci. 2018 Apr 13;131(8):jcs189928.
DOI: 10.1242/jcs.189928

COSTA, J.A.E. Amiloidose aa e nefropatia: patogénese, diagnóstico e tratamento (Mestrado). Porto: Universidade do Porto, Instituto de ciências biomédicas Abel Salazar. Citado em 08/07/2023.
https://repositorio-aberto.up.pt/bitstream/10216/52764/2/Amiloidose%20AA%20e%20nefropatia.pdf

DONNELLY, J.P., MAZEN, H., BRETT, W.S., WILLIAM, H.S. Carpal Tunnel Syndrome: A Potential Early, Red-Flag Sign of Amyloidosis, The Journal of Hand Surgery, Volume 44, Issue 10. 2019.
https://doi.org/10.1016/j.jhsa.2019.06.016

DOUGLAS, P.M., TREUSCH, S., REN, H-Y., HALFMANN, R., DUENNWALD, M.L., LINDQUIST, S, CYR, D.M. Chaperone-dependent amyloid assembly protects cells from príon toxicity. PNAS – Biological sciences, 105 (20) 7206-721. 2008.
https://doi.org/10.1073/pnas.0802593105

DOYLE, S.M., GENEST, O., WICKNER, S. Protein rescue from aggregates by powerful molecular chaperone machines. *Nat Rev Mol Cell Biol* 14, 617–629. 2013.
https://doi.org/10.1038/nrm3660

HEEGGARD, N.H.H. β_2 -microglobulina: da fisiologia à amiloidose, Amyloid, 16:3, 151-173. 2009.
https://doi.org/10.1080/13506120903151775

KARUNARATHNE, k. BUSHRA, N., WILLIAMS, O., RAZA, I. TIRADO, L., FAKHRE, D., FAKHRE, F., MUSCHOL, M. *Biomolecules*, *13*(2), 230. 2023.
https://doi.org/10.3390/biom13020230

KYLE, R.A. Amyloidosis: a convoluted story. British Journal of Haematology, 114: 529-538. 2001.
https://doi.org/10.1046/j.1365-2141.2001.02999.x

LARREA, C.F., VERGA, L., MORBINI, P., KLERSY, C., LAVATELLI, F., FOLI, A., OBICI, L., MILANI, P., CAPELLO, F.L., PAULLI, M., PALLADINI, G., MERLINI, G. A practical approach to the diagnosis of systemic amyloidoses. Blood, Volume 125, Issue 14, pag 2239-2244. 2015.
https://doi.org/10.1182/blood-2014-11-609883

LINDBERG, I., SHORTER, J., WISEMAN, L., CHITI, F., DICKEY, C.A., McLEAN, P. Chaperones in Neurodegeneration. The Journal of Neuroscience, 35(41):13853–13859. 2015.
DOI:10.1523/JNEUROSCI.2600-15.2015

MANGANELLI, F., FABRIZI, G.M., LUIGETTI M., MANDICH, P., MAZZEO, A., PAREYSON, D. Hereditary transthyretin amyloidosis overview. Neurol Sci. Dec;43(Suppl 2):595-604. 2022.
DOI: 10.1007/s10072-020-04889-2.

MONTEIRO, N.F., DIZ, M.C.E. Dificuldades no diagnóstico da amiloidose primária: relato de caso. Revista Médica de Minas Geraes. V.25.2, 2015.
DOI: http//www.dx.doi.org/10.5935/2238-3182.20150048

MUCHTAR, E., DISPENSZIERI, A., MAGEN, H., GROGAN, M., MAUERMANN, M., McPHAIL, E.D., KURTIN, P.J., LEUNG, N., BUADI, F.K., DINGLI, D., KUMAR, S.K., GERTZ, M.A. Systemic amyloidosis from A (AA) to T (ATTR): a review. Journal of Internal Medicine. Volume 289, Issue 3. 2021

https://doi.org/10.1111/joim.13169

MURONETZ, V.I., KUDRYAVTSEVA, S.S., LEISI, E.V., KUROCHLINA, L.P., BARINOVA, K.V., SCHMLHAUSEN, E.V. Int J Mol Sci. Mar; 23(5): 2747.2022.
DOI: 10.3390/ijms23052747

OBICI, L., PERFETTI, V., PALLADINI, G., MORATTI, R., MERLINI, G. Clinical aspects of systemic amyloid diseases, Biochimica et Biophysica Acta (BBA) - Proteins and Proteomics, Volume 1753, Issue 1, pag 11-22. 2005.
https://doi.org/10.1016/j.bbapap.2005.08.014

PALLADINI, G., MERLINI, G. Current treatment of AL amyloidosis. Haematologica. Aug;94(8):1044-8. 2015.
DOI: 10.3324/haematol.2009.008912.

PANAHI, A.V.S. The Importance of Macrophages, Lipid Membranes and Seeding in Experimental AA Amyloidosis. Linköping University Medical Dissertation No.1687. 2019. Citado em 20/07/2023: https://www.diva-portal.org/smash/get/diva 2:1343021/FULLTEXT01.pdf%20%20

PEDRO, L., PINHO, R., MARQUES, N. Amyloidosis – A review. Trends in Medicine Volume 19: 1-6. 2019.
DOI: 10.15761/TiM.1000206

PICKEN, MM. The Pathology of Amyloidosis in Classification: A Review *Acta Haematol* 143 (4): 322–334, 2020.
https://doi.org/10.1159/000506696

PRASAD, K. AGE–RAGE stress: a changing landscape in pathology and treatment of Alzheimer's disease. *Mol Cell Biochem* **459**, 95–112. 2019.
https://doi.org/10.1007/s11010-019-03553-4

REAL de ASÚA, D., COSTA, R., GALVÁN, J.M., FILIGHEDDU, M.T., TRUJILLO, D., CADIÑANOS, J. Systemic AA amyloidosis: epidemiology, diagnosis, and management. Clin Epidemiol. 29;6:369-77. 2014.
DOI: 10.2147/CLEP.S39981

SEIXAS, J.R.O. Polineuropatia amiloidótica familiar: uma revisão bibliográfica (Mestrado). Porto: Universidade do Porto, Instituto de ciências biomédicas Abel Salazar. Citado em 08/07/2023.
https://repositorio-aberto.up.pt/bitstream/10216/88132/2/169062.pdf

TASAKI, M., LAVATELLI, F., OBICI, L., OBAYASHI, K., MIYAMOTO, T., MERLINI, G., PALLADINI, G., ANDO, Y., UEDA, M. Age-related amyloidosis outside the brain: A state-of-the-art review, Ageing Research Reviews, Vol. 70, 101388. 2021,
https://doi.org/10.1016/j.arr.2021.101388.

THIBAUDEAU, T.A., ANDERSON, R.T., SMITH, D.M. A common mechanism of proteasome impairment by neurodegenerative disease-associated oligomers. Nature communications, 9:1097. 2018.
DOI: 10.1038/s41467-018-03509-0

THORNE, J., CLARK, D., GELDENHUYS, L., MORE, K., VINSON, A., TENNANKORE, K. Serum Amyloid A Protein-Associated Kidney Disease: Presentation, Diagnosis, and Management. Kidney Med. 26;4(8):100504. 2022.

DOI: 10.1016/j.xkme.2022.100504

TÜRKER, F., COOK, E.K., MARGOLIS, S.S. The proteasome and its role in the nervous system. Cell Chemical Biology 28, 2021.
http://doi.org/10.1016/j.chembiol.2021.04.003

WENTINK, A., NUSSBAUM-KRAMMER, C., BUKAU, B. Modulation of Amyloid States by Molecular Chaperones. Cold Spring Harb Perspect Biol. Jul; 11(7): a033969. 2019.
DOI: 10.1101/cshperspect.a033969

WESTERMARK, P., WESTERMARK, G.T. Review. Reflections on amyloidosis in Papua New Guinea. Philos Trans R Soc Lond B Biol Sci. Nov 27;363(1510):3701-5. 2008.
DOI: 10.1098/rstb.2008.0073.

WESTERMARK, G.T., FÄNDRICH, M.; WESTERMARK, P. AA amyloidosis: Pathogenesis and trageted Therapy. Annual Review of Pathology: Mechanisms of Disease. Vol. 10:321-344. 2015.
https://doi.org/10.1146/annurev-pathol-020712-163913

WYATT, A. R., YERBURY, J. J., DABBS, R. A., WILSON, M. R. Roles of extracellular chaperones in amyloidosis. Journal of Molecular Biology, 421 (4-5), 499-516. 2012.
http://dx.doi.org/10.1016/j.jmb.2012.01.004

XAVIER, F. Amiloidose Revisão Bibliográfica (Mestrado). Universidade da Beira Interior: Faculdade de Ciências da Saude. Mestrado integrado em medicina. 2008. Citado em 08/07/2023.
https://ubibliorum.ubi.pt/bitstream/10400.6/864/1/Amiloidose.pdf

ZEGRI-REIRIZ, I., de HARO-del MORAL, FJ, DOMINGUES, F. *et al.* Prevalência de Amiloidose Cardíaca em Pacientes com Síndrome do Túnel do Carpo. *J. de Cardiovasc. Trans. Res.* 12, 507–513 2019.
https://doi.org/10.1007/s12265-019-09895-0

SEVEN publicações acadêmicas

From the first asylum of Minas Gerais to the psychiatric reform and its development in the municipality of Diamantina, Brazil

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ABSTRACT
Psychiatric Reform (PR) emerged in the 18th century as part of a deinstitutionalization movement for psychiatric patients, who were previously subjected to institutionalization and thus excluded from social interaction. The objective of this study was to present the primary experiences of Psychiatric Reform during key historical moments in the development of the Psychosocial Care Network (PCN), even within the municipality of Diamantina, Minas Gerais, Brazil. Methodology: A literature review was conducted across various databases, utilizing the following keywords: Psychiatric Reform, mental health, and psychosocial care. Results: The quest for an understanding of the evolution of Brazilian Psychiatric Reform up to the present time, including its implementation in the municipality of Diamantina, allows for an examination of both the achievements and vulnerabilities in constructing this psychosocial support network.

Keywords: Psychiatric hospitals, Mental health, Deinstitutionalization.

1 INTRODUCTION

According to Foucault (1972), the 17th century witnessed the so-called "great internment," during which the realm of madness became, a world of social exclusion. This era saw the construction of various internment houses across Europe serving as spaces for reception, correction, and confinement. These houses were intended not only for the insane, but also for libertines, magicians, prostitutes, and thieves. Amid political, economic, social, and moral issues, the establishment of these institutions marked the moment when madness was perceived within the context of poverty and the inability to work, thus identifying it as a social problem.

The internment of the insane was a socio-political instrument that was not guided by medical criteria. What united individuals within the "world of inmates" was their inability to contribute to wealth production, circulation, and accumulation (Foucault, 1972).

By the end of the 18th century, the practice of confining individuals, a hallmark of absolutism, had to be abolished in light of the ideals of the French Revolution: "Liberty, Equality, and Fraternity." Nevertheless, there was still a perceived need to segregate the insane to maintain order, a goal achieved through enlightenment ideals of scientificity and the valorization of reason. At this point, madness became the subject of a psychiatric study aimed at isolating "mentally ill" individuals for pure observation. Thus, madness became institutionalized as defined by medical knowledge/power (Amarante, 1998; Cedraz & Dimenstein, 2005).

To create a specific space for madness and the development of psychiatric knowledge, Philippe Pinel, considered the father of psychiatry, proposed a new form of treatment for the insane. He freed them from the chains and transferred them to asylums exclusively for the mentally ill. Pinel's asylum treatment primarily focused on re-educating patients, adhering to norms, and discouraging inappropriate behavior, all under the disciplinary authority of doctors and the asylum. This underscores the moral character attributed to madness (Amstalden & Passos, 2008).

However, Pinel's moral treatment has undergone modifications over time, losing its original ideals. Corrective practices for the behavior and habits of the mentally ill remained, but now as a means of enforcing institutional order and discipline. In the 19th century, treatment for the mentally ill included physical measures, such as showers, cold baths, whippings, rotating machines, and bloodletting (Amstalden & Passos, 2008).

Gradually, with the advancement of organicist theories, what was once considered a moral illness became understood as an organic disease. However, the treatment techniques employed by organicists were the same as those used by the proponents of moral treatment. This means that despite a new understanding of madness stemming from experimental discoveries in neurophysiology and neuroanatomy, the submission of the insane endured and extended into the 20th century (Amstalden & Passos, 2008).

This period set the stage for the contemporary psychiatric reform project, renewing criticism and reform of the asylum institution. Pinel had already emphasized the contradictions between psychiatric practices and institutions of great confinement. Subsequent reforms sought to challenge the role and nature, at times as an asylum institution and at times of psychiatric knowledge, raising new questions on the world's historical stage (Amarante, 1998).

The end of World War II in Europe, as identified by Desviat (1999), marked the emergence of the first challenges to the established model of care in which asylum had become a central element. Similar to the Nazi concentration camps that shocked the world in the 1940s, the conditions in the asylums at the end of World War II caused outrage and were incompatible with democratic projects for the reconstruction of Europe. Moreover, the war caused severe psychological trauma to a significant contingent on young men, whose workforce needed to be rehabilitated (Desviat, 1999).

The historical trajectory of mental health extends beyond a single moment, movement, or period. It involves traversing a path that encompasses various characteristics related to the socio-political and economic context of each era.

Different experiences and models have emerged in France, England, the United States, and Italy. Italy initiated a more radical model influenced by Franco Basaglia, who viewed psychiatric hospitals as threats to humanity (Amstalden & Passos, 2008). According to Costa (1985), Psychiatric Reform movements can be categorized as follows:

a) Reforms limited to psychiatric hospitals: institutional psychotherapy and therapeutic communities.
b) Reforms aimed at integrating extra-hospital services with the hospital: sector psychiatry and preventive psychiatry.
c) Reforms that introduced a rupture with previous ones, questioning both the body of knowledge and the practices of current psychiatry: antipsychiatry and democratic psychiatry.

2 METHODOLOGY

This study constitutes a literature review conducted through an electronic search of various databases. The descriptors used were: Psychiatric Reform, mental health, and psychosocial care. We conducted a survey of manuscripts associated with this theme. The selection was based on the following inclusion criteria: full-text references in Portuguese, regardless of publication date.

3 THEORETICAL REFERENCE

3.1 INSTITUTIONAL PSYCHOTHERAPY AND THERAPEUTIC COMMUNITIES

Institutional psychotherapy originated in France at the end of World War II. It considered psychiatric hospitals to be "ill" and in need of treatment; they should be reformed to become truly therapeutic and capable of reintegrating patients into society. Heavily influenced by psychoanalysis, institutional psychotherapy emphasizes the importance of the therapist-patient relationship in treatment. It aimed to create a collective field within the hospital, helping patients rebuild their connections with people and things. It encourages practices such as workshops, recreational activities, parties, meetings, and more (Minas Gerais, 2006).

Therapeutic communities emerged in England at the same time with the goal of turning psychiatric hospitals into therapeutic spaces. They encourage patients to actively participate in the hospital's administration, their own treatment, and the treatment of others. Special emphasis was placed on holding meetings, assemblies, and other spaces where patients could have an active voice in the institution (Minas Gerais, 2006).

While these two movements had specificities, they shared a common objective: challenging the authoritarian hierarchy in relationships between staff and patients and emphasizing equal and mutually respectful relationships in the treatment of those with mental suffering. However, they faced a limitation: How to democratize the internal functioning of an institution without questioning the authoritarianism and injustices of the society from which they derived? (Minas Gerais, 2006).

Another similarity between institutional psychotherapy and therapeutic communities was their aim to provide dignified and humane treatment to patients, but this support was limited to the period of hospitalization. After discharge, patients lack the support or assistance needed for their return to social life (Minas Gerais, 2006).

3.2 SECTOR PSYCHIATRY AND PREVENTIVE PSYCHIATRY

Sector psychiatry emerged from institutional psychotherapy in France in the 1950s. In this model, the focus of care should shift from the hospital to the extra-hospital space, establishing territorialization of care. The sector is defined as a well-defined geographical area, accompanied by the same Mental Health team, with its own extra-hospital services, such as post-care homes, sheltered workshops, and therapeutic clubs (Minas Gerais, 2006).

In the 1950s, preventive psychiatry began in the United States, promoting three levels of prevention. Primary prevention aims to intervene in individual and environmental conditions that contribute to mental illness formation. Secondary prevention aimed to diagnose these illnesses early, whereas tertiary prevention sought to reintegrate the patient into social life after improvement. Psychiatric hospitalization was only considered when other possibilities were exhausted and for short periods (Minas Gerais, 2006).

These different reform proposals also share common elements. Both sought to reduce the role of psychiatric hospitals and to create community-based treatment alternatives to reduce the number and duration of hospitalizations. However, the psychiatric hospital remained an essential reference, and it seemed inconceivable to envision a care model that could do so without it. Moreover, there has been progress in valuing the psychosocial aspects of mental distress; however, the medicalizing and interventionist stance often overshadows these aspects.

Although the importance of community contributions was emphasized, these proposals were formulated and led by professionals, with little involvement from individuals suffering from mental distress and their families in the development of Mental Health policies (Minas Gerais, 2006).

3.3 ANTIPSYCHIATRY AND DEMOCRATIC PSYCHIATRY

Antipsychiatry emerged in England in the 1960s. It was not a proposal for Psychiatric Reform but rather an entirely new perspective on madness. It originated from bold experiences within

therapeutic communities that ultimately transcended institutional boundaries. Madness was no longer viewed as an illness but as a reaction to family imbalances and social alienation (Minas Gerais, 2006).

Democratic psychiatry emerged in Italy in the 1960s, stemming from the challenges faced in implementing therapeutic community proposals. In the city of Trieste, a large psychiatric hospital was gradually dismantled, concurrently creating opportunities for former inpatients to reintegrate into the society. Mental Health Centers, operating 24 hours a day in an open-door system, began serving all cases that had previously sought the hospital, including, and especially, the most severe cases. They establish opportunities for users in terms of mobility, employment, culture, and leisure within the city (Minas Gerais, 2006).

To achieve this, it was necessary to criticize the medical and psychological appropriation of madness. According to democratic psychiatry, the walls of the asylum symbolize the domination of the words, actions, and decisions of the so-called mad individuals in the name of science. Therefore, the aim was to provide those suffering from mental distress with a real space for citizenship; that is, to offer them a place as protagonists of social transformation, reclaiming their own lives as legitimate city dwellers. This movement prohibited the construction of new psychiatric hospitals in Italy (Minas Gerais, 2006).

Consequently, these experiences brought about a rupture with previous approaches, particularly Democratic Psychiatry, whose impact has reached a global scale. For the first time, it was asserted that the extinction of a psychiatric hospital was possible and necessary, given the failure of all previous efforts to transform it into a therapeutic space. Additionally, the supposed neutrality of science was questioned, demonstrating that scientific knowledge depends on power relations and takes sides within them (Minas Gerais, 2006).

These changes not only involved Mental Health professionals, but also engaged various stakeholders, sparking debates and mobilizations that encompassed other social segments.

3.4 PSYCHIATRIC REFORM IN BRAZIL

In Brazil, as in other parts of the world, efforts have been made to continue to create new places and new perspectives for caring, treating, and most importantly, reintegrating individuals with mental distress or disorders, including those with psychoactive substance needs. The Brazilian psychiatric reform was based on the Italian movement. The reform in Brazil began in the late 1970s. With the increasing privatization of psychiatric hospital beds in profit-driven hospitals, the institutional and financial crisis of social security, and the fact that public health was essentially assistance-oriented, hospital-centered, and inefficient, it was evident that the country's healthcare system needed reformulation (Amarante, 1994).

The trajectory of the movement was marked by the notion of deinstitutionalization, fitting into a political context of great importance to Brazilian society. The 1980s were characterized by the struggle for a truly democratic state after 20 years of military dictatorship. In this context, the paths of psychiatric reform are closely linked to those of healthcare reform. According to Amarante (1998), the psychiatric reform movement in Brazil was triggered by the crisis of the National Division of Mental Health (DINSAM), a division of the Ministry of Health, and the Mental Health Workers Movement (MTSM). Regarding the MTSM, it is enough to remember that this movement denounced the lack of resources in mental health units and the resulting precarious working conditions, which affected the care provided to the population, with its main focus on labor and humanitarian aspects.

A decisive turning point at that time was the 3rd Minas Gerais Psychiatry Congress held in Belo Horizonte in 1979. With guests, such as Franco Basaglia, and the participation of users and family members, the discussion expanded, reaching the entire country's public opinion. In this context, the Mental Health Workers Movement emerged, and their meeting in Bauru in 1987 coined the famous slogan "For a society without asylums," paving the way for the birth of the anti-asylum struggle (Minas Gerais, 2006).

Despite advancements in Psychiatric Reform, by the late 1980s, Brazil still had 100,000 beds in 313 psychiatric hospitals, with 20% being public and 80% privately affiliated with the Unified Health System (SUS), mainly concentrated in Rio de Janeiro, São Paulo, and Minas Gerais. Public spending on psychiatric hospitalizations ranks second among all expenses paid by the Ministry of Health (Minas Gerais, 2006).

In the path to the Brazilian Sanitary Reform, the 8th National Health Conference in 1986 and the Federal Constitution of 1988 represented the cornerstone for subsequent Psychiatric Reform, defining psychological care without the discrimination that prevailed at the time and healthcare as a right for all (National Health Conference, 1986; Brazil, 1988).

The 1990s represented one of the most remarkable periods in the trajectory of this reform, seeking deinstitutionalization or deconstruction/invention and the consequent construction and implementation of something genuinely new based on humanitarian principles and focused on citizenship (Amarante, 1998). The Brazilian Psychiatric Reform became embedded within the SUS's doctrinal principles, and in 1990, the Caracas Declaration outlined the framework for mental healthcare projects in the Americas (World Health Organization, 1990).

From the 2nd National Mental Health Conference in 1992, guidelines emerged to direct the restructuring of mental health care, proposing an articulated network of substitute services, with a significant focus on the implementation of resources for the first Psychosocial Care Centers (CAPS), ordinances, and incentives for deinstitutionalization (Pitta, 2011).

The Psychosocial Care Centers (CAPS), Psychosocial Care Nuclei (NAPS), Mental Health Reference Centers (CERSAM), and other asylum model substitute services are currently regulated by Ordinance No. 336/GM on February 19, 2002, and are part of the Unified Health System network (Brazil, 2002).

This ordinance recognizes and expands the operation and complexity of CAPS, which aims to provide continuous care to individuals suffering from severe and persistent mental disorders in a given territory, offering clinical care and psychosocial rehabilitation with the aim of replacing the hospital-centered model, avoiding hospitalizations, and promoting the exercise of citizenship and social inclusion for users and their families (Brazil, 2004).

CAPS consists of three service modalities, CAPS I, CAPS II, and CAPS III, defined in increasing order of size/complexity and population coverage. Their characteristics, as specified in Ordinance No. 336 on February 19, 2002 (Brazil, 2002), are described below.

a) CAPS I: All age groups; severe and persistent mental disorders, including psychoactive substance use; serves cities and/or regions with at least 15,000 inhabitants.
b) CAPS II: All age groups; severe and persistent mental disorders, including psychoactive substance use; serves cities and/or regions with at least 70,000 inhabitants.
c) CAPSi: Children and adolescents; severe and persistent mental disorders, including psychoactive substance use; serves cities and/or regions with at least 70,000 inhabitants.
d) CAPS Ad - Alcohol and Drugs: All age groups; specialized in disorders related to alcohol and other drug use; serves cities and/or regions with at least 70,000 inhabitants.
e) CAPS III: Provides overnight shelter and observation for up to five vacancies; all age groups; severe and persistent mental disorders, including psychoactive substance use; serves cities and/or regions with at least 150,000 inhabitants.
f) CAPS Ad III - Alcohol and Drugs: Provides overnight shelter and observation for 8–12 vacancies; operates 24 hours; all age groups; disorders related to alcohol and other drug use; serves cities and/or regions with at least 150,000 inhabitants.

3.5 WHERE ARE WE AFTER THE PSYCHIATRIC REFORM

Sixteen years after the enactment of Law No. 10,216 of 2001, which determined the creation of a substitute network following the guidelines of the Psychiatric Reform to overcome the asylum model and guarantee and promote the citizenship rights of people with mental disorders (Brazil, 2001), the landscape of public mental health care in the country has been transforming, with primary care acting as the organizer and director of such care. Therefore, a true theoretical-conceptual revolution is necessary to understand the individuals involved in this broad and complex social process, as well as

an expanded concept of health, clinical care, interdisciplinary and intersectoral work, the notion of a network, and territoriality (Amarante, 2007).

The first Psychosocial Care Center (CAPS) in Brazil was inaugurated in March 1986 and became known as CAPS Itapeva in São Paulo, SP. CAPS was the first substitute service considered as a reference and treatment location for individuals with severe and persistent mental disorders, which justifies the patient's stay in a place of intensive, community-based, personalized, and health-promoting care (Brazil, 2004).

In 2010, the Ministry of Health adopted the strategy of organizing the Unified Health System (SUS) through the creation of healthcare networks, which are organizational arrangements of health actions and services of different technological densities, integrated through technical, logistical, and management support systems, aimed at ensuring comprehensive care (Brazil, 2010).

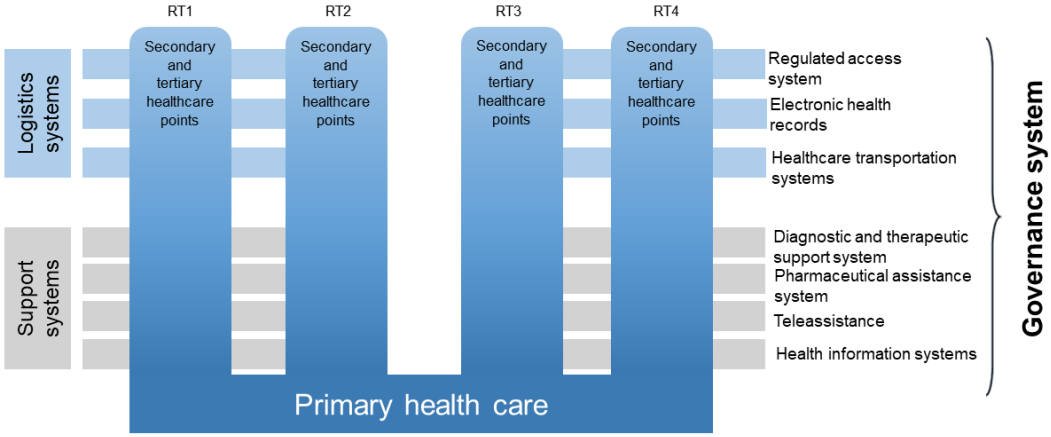
According to Mendes (2010), Health Care Networks are oligarchic organizations of sets of health services linked together by a single mission, common objectives, and cooperative and interdependent action, allowing for continuous and comprehensive care to a specific population, coordinated by Primary Health Care (PHC), provided at the right time, in the right place, at the right cost, with the right quality, in a humanized manner, and with equity, with health and economic responsibilities and generating value for the population.

Healthcare systems operate in a dialectical relationship between contextual factors (population aging, epidemiological transition, scientific and technological advances) and internal factors (organizational culture, resources, incentive systems, organizational structure, leadership style, and management style). Under sectoral governance, contextual factors, which are external to the healthcare system, change more rapidly than internal factors under sectoral governance (Mendes, 2011).

In this context, healthcare systems cannot adapt to contextual changes, especially demographic and epidemiological ones. This is the universal crisis of healthcare systems that was conceived and developed with a presumption of continuity, focused on acute conditions and events, and disregarding the contemporary epidemic of chronic conditions. As a result, we have a 21st-century health situation governed by a 20th-century healthcare system, when acute conditions predominated (Mendes, 2011).

Healthcare networks consist of three elements: population, operational structure, and healthcare model, as illustrated in Figure 1.

Figure 1. Operational structure of health care networks.



Fonte: MENDES (2011). Adapted.

These three elements are characterized as follows by Ordinance No. 4,279/10 (BRASIL, 2010):

a) Population and Health Region: To preserve, recover, and improve people's and community health, Health Care Networks (RAS) must be able to clearly identify the population and geographic area under their responsibility. The health region must be well-defined based on spatial and temporal parameters that ensure that the structures are well-distributed territorially, guaranteeing the necessary response time for care, a better structure/population/territory ratio, and sustainable operational viability.

b) Operational Structure: The operational structure of RAS consists of different healthcare points, that is, institutional places where health services are offered, and the connections that communicate them. The components that structure the RAS include Primary Health Care, communication centers, secondary and tertiary care points, support systems, logistical systems, and the governance system.

c) Health Care Model: The health care model is a logical system that organizes the operation of RAS, uniquely articulating the relationships between the population and its subpopulations stratified by risks, the focus of health care system interventions, and the different types of health interventions. It operates based on the prevailing health vision, demographic and epidemiological situations, and social determinants of health prevailing at a given time and in a given society.

The implementation of RAS requires a change in the current hegemonic care model in the Brazilian Unified Health System (SUS), which requires simultaneous intervention in acute and chronic conditions. The RAS is organized thematically based on the need to address vulnerabilities, diseases, or conditions affecting individuals or populations. They are also cross-cutting themes related to qualification, education, information, regulation, and health promotion and surveillance (BRASIL, 2010).

The following thematic networks are prioritized:

a) Stork Network

b) Urgent and Emergency Care Network

c) Psychosocial Care Network

d) Network for the Care of Chronic Diseases and Conditions

e) Network for the Care of People with Disabilities (BRASIL, 2010).

As of the completion of this work, the national psychosocial care network consists of2,465 Psychosocial Care Centers (CAPS), including 424 specialized in alcohol and drug-related care, 35 Child and Adolescent Shelter Units (UAI), 21 Adult Shelter Units (UAA), 1,163 Mental Health beds in general hospitals, 104 Street Clinics under the responsibility of Primary Health Care, and 493 Therapeutic Residential Services (SRT) for people in vulnerable situations who have been hospitalized in psychiatric or custodial hospitals for an extended period (BRASIL, 2017a).

It can be observed that the RAS has expanded in recent years; for example, between 2014 and 2017, there was a 36% increase in the availability of Mental Health beds in general hospitals. In addition, the Ministry of Health has made significant investments in funding establishments and Street Clinics that make up RAS (BRASIL, 2017a).

It is estimated that 23 million Brazilians have some form of mental disorder, with 5 million in the moderate-to-severe range. This population relies on well-structured RAS for appropriate treatment. However, the Ministry of Health conducted a national survey and identified, among other things, the mismanagement of resources allocated to construction projects, low occupancy of mental health beds in general hospitals, and underreporting in care and production records, thereby compromising the quality and effectiveness of the network (BRASIL, 2017a).

The urgency for RASs across Brazil to function effectively is highlighted when observing a new epidemiological reality for mental health: a significant increase in chemical dependence on crack and other drugs associated with abusive alcohol use and dependence. There has also been an increase in suicide rates, which is the fourth leading cause of death among young people and has a high prevalence among the elderly - 8.9 deaths per 100,000 in the last six years (BRASIL, 2017b).

3.6 HISTORICAL TRAJECTORY OF MENTAL HEALTH IN THE CITY OF DIAMANTINA/MG

It is a fact that the history of the Psychosocial Care Network (RAPS) in Diamantina, Minas Gerais, did not begin after the principles of Psychiatric and Sanitary Reforms. A municipality's mental health network is rich in history, exuberance, gaps, politics, religion, power, charity, treatment, and other characteristics. This is attributed to the presence of Minas Gerais' first asylum in Diamantina, the cornerstone of which was laid in 1888. In the work entitled "Hospício da Diamantina - Madness in the Modern City" by the Diamantina author Maria Claudia Almeida Orlando Magnani, a professor at the

Federal University of Vales do Jequitinhonha and Mucuri (UFVJM), stemming from her master's thesis, she sought to comprehend:

> "What was that asylum, when did it start attending patients, with what objectives, what reality created the need for its existence, who were its patients, and what were its doctors aiming to achieve?" These questions became even more intriguing as the documents and sources proved to be scarce and damaged. Possible answers to these questions are grounded in this dissertation from the perspective of a historical understanding of madness and mental medicine in Europe and Brazil (always considering the peculiarities of Brazilian and Minas Gerais societies in the 19th century). Therefore, I constructed my master's project with the overarching goal of recovering and extracting information from sources as much as possible and attempting to historically understand the metaphorical cries of the asylum, which did not remain silent. The history of the Diamantina Asylum, involving the discourse on madness at the end of the 19th century, has emerged as a borderline object between history and other fields of knowledge, such as sociology. Thus, investigating asylum requires a comprehensive effort to understand the broader social fabric that engendered it from various angles. The construction of the asylum was understood as part of a modernizing process occurring in Diamantina at the end of the 19th century, which, in turn, needed to consider the understanding of the modern city's relationship with the asylum and madness, viewed through a new medical perspective: the perspective of psychiatry, which, as a normative discipline, transformed madness into mental alienation and sought to cure it (Birman, 1978). The understanding of Diamantina Asylum in all its complexities, therefore, demands a broader comprehension of the city of Diamantina concerning the intricacies of its multifaceted urbanity and the medical knowledge that was established alongside it (MAGNANI, 2008).

The aforementioned author was involved in the construction of the RAPS in Diamantina, MG when she describes, "In this process, accompanying the elaboration of a substitutive mental health service project for the region, I came across the collection of the Santa Casa de Caridade de Diamantina, abandoned in a damp cellar, in a deplorable state of preservation" (MAGNANI, 2008). Mercy's Holy Houses actively participated in providing assistance to the mentally ill in Minas Gerais in the 19th century. Among these, the Santa Casa de Caridade de Diamantina (SCCD) was highlighted by Gonçalves and Goulart as follows:

> "We chose to investigate the participation of the Holy Houses of Mercy in the history of mental health assistance policy in Minas Gerais, based on the paths outlined by the Royal Road. It can be said that this road inaugurated the path of conquest, the path of gold, diamonds, and, above all, power from Colonial Brazil. The Royal Road was built between the late 17th and early 18th centuries, establishing a connection between Rio de Janeiro and the provinces to be explored in Minas Gerais. Among these provinces, two districts stand out, Vila Rica (now Ouro Preto) and Vila do Príncipe/Arraial do Tijuco (currently Serro and Diamantina, respectively). Royal Road has two paths along its trajectory. The old path connected the city of Paraty in Rio de Janeiro to Vila Rica in Minas Gerais, while the new path went from Paraty to Arraial do Tijuco (Diamantina). The new path was constructed after the discovery of diamonds in the Serro region" (GONÇALVES, GOULART, 2015).

Most hospitalizations occurred in the Holy Houses of Mercy in the municipalities of São João Del Rei and Diamantina. In addition to the hospitalizations carried out in the Holy Houses of Mercy within the state, there was a convention established with the Hospital of Rio de Janeiro in 1982, ensuring a specific number of beds for referrals from the state of Minas Gerais (MAGRO FILHO,

1992). The construction of the asylum was part of a process involving economic, social, and political issues, as pointed out by MAGNANI (2008):

> The new reality of the city of Diamantina in the late 19th century, in terms of the creation and complexification of spaces of sociability and the outbreak of industrialization that made it possible to some extent, coexisted with a new medical discourse that extended to the understanding and approach to madness. At the same time, old social relationships coexist with transformation. Strictly speaking, both the aspirations of modernization in the city and the aforementioned industrial outbreak were promises that were not fulfilled. Diamantina did not confirm itself as a significant industrial center in the 20th century, and pre-modern elements seem to me to still be too determinative for a city that aimed to modernize. The decline in diamond mining, which was addressed by the textile industry, was not definitive. Until the almost complete exhaustion of diamond veins in the late 20th century, the city lived from the exploitation, cutting, and trade of diamonds at the mercy of fluctuations in the international precious stone market. If the Diamantina Asylum were, on the one hand, a response to the need to isolate the mentally ill who, wandering the streets, interfered with the city's redevelopment and its need for orderly development; on the other hand, a response to the new needs for treatment and cure imposed by the new medical knowledge that introduced a new conception of madness and normality, it is possible that the specificity of the modernizing process in Diamantina is somewhat linked to the rapid closure of the asylum. Thus, it is possible that the asylum was born alongside the promise of modernizing the city and closed its doors when the promise collapsed before it was fulfilled. Diamantina did not have a sufficiently strong political and economic representation to maintain the state funds earmarked for the asylum for the mentally ill, which, at the beginning of the 20th century, favored the city of Barbacena as the headquarters of a state asylum" (MAGNANI, 2008).

As pointed out by Magro Filho (1992), most hospitalizations occur in the Holy Houses of Mercy in the municipalities of São João Del Rei and Diamantina. In addition to the hospitalizations carried out in the Holy Houses of Mercy within the state, a convention was established with the Hospital of Rio de Janeiro in 1982, ensuring a specific number of beds for referrals from the state of Minas Gerais.

The closure of the Diamantina Asylum took place in 1903, even before it was officially inaugurated. However, the asylum has been active for nearly 20 years despite being an unfinished construction due to a lack of resources and continued to admit patients (MAGNANI, 2008).

> It continues to provide good services; despite being unfinished, the establishment we founded, attached to the Holy House, for the treatment of the exiled reason. The Minas Gerais Congress, which until then had not refused to heed our demands on behalf of the asylum for the mentally ill in Diamantina, bestowed upon it an annual allowance of 2,000$ and in the last fiscal year with 5,000$000, in its recent meeting, when preparing the expenditure law for 1900, left the aforementioned establishment aside and withdrew its subsidy, based on the convenience of reducing the state's burdens; however, it spent only 21 contos on caring for the mentally ill, with 11 contos at the national asylum and five contos each in the asylums of São João Del Rei and Diamantina. With the project to establish a state asylum for the mentally ill, it is believed that this concession will not be reinstated, leaving the work that has cost us so much sacrifice and effort solely to its own resources" (BRANT, 1899, pp. 11-12).

The non-renewal of the National Asylum's agreement with Minas Gerais, along with excessive spending on maintaining the mentally ill from the state in the Holy Houses of Mercy, led to the proposal for the creation of assistance for the mentally ill in 1900. In 1903, the Psychiatric Hospital of Barbacena was inaugurated and was considered one of the largest hospitals in Brazil. At this time, all the resources

previously allocated to the Holy Houses of Mercy in São João Del Rei and Diamantina were directed and centralized solely in Barbacena, without the need for agreements and assistance to other states. In the same period, the first law on the mentally ill was created, as mentioned by Magnani (2008), in which the alienation of rights began to be used as a form of authority, making psychiatry the holder of powers. Consequently, many individuals with mental illnesses never returned to their homes or ended up on the streets, as treatment houses no longer existed.

3.7 THE PSYCHOSOCIAL CARE NETWORK IN DIAMANTINA

The evolution of regionalization and municipalization models has enabled the Brazilian Unified Health System (SUS) to develop a healthcare assistance network in the 2000s, in line with the Antimanicomial Movement. In Diamantina, the efforts of key local health managers, including the Intermunicipal Health Consortium of Alto Jequitinhonha (CISAJE), Municipal Health Secretariat of Diamantina, Regional Health Directorate of Diamantina, and Santa Casa de Caridade de Diamantina, facilitate the establishment of an open and local mental health service.

According to the resolution CIB-SUS/MG No. 1092, dated April 4, 2012, which established the Psychosocial Care Network for individuals with Mental Disorders and needs arising from the use of alcohol, cracks, and other drugs within the scope of the Unified Health System of Minas Gerais/SUS-MG, the Mental Health Network for the municipalities in the microregion of Diamantina-MG was approved (MINAS GERAIS, 2012).

Referring to the commitment spreadsheet for the implementation of the components of the Psychosocial Care Network, conducted on May 10, 2012, at the CIB Micro Diamantina, the following agreements, as presented in Table 1, are mentioned.

Table 1. Composition of RAPS network points in Diamantina-MG (2012).

Components of the RAPS	**Key Focus Areas**	**RAPS Diamantina/MG**	**CIB Micro Diamantina Agreement - May 2012**
Primary health care	Basic health unit; Family health support center; Street clinic; Community and culture centers;	Basic Health Units (UBS/ESF): 8 urban units 3 rural units Nucleus of Support for Family Health (NASF): Not available Street Clinic: Not available Community and Culture Centers: Not available	Maintain the service (ESF), does not have NASF
Strategic psychosocial care	Psychosocial care centers in various modalities;	CAPS II for Mental Disorders CAPS AD for Alcohol and Drug users	Reclassify CAPS II to CAPS III; Requalify CAPS Ad II to CAPS Ad III;

Components of the RAPS	Key Focus Areas	RAPS Diamantina/MG	CIB Micro Diamantina Agreement - May 2012
		Both for users above 18 years old	Open and implement CAPS in 2013;
Urgent and emergency care	Mobile emergency medical service (SAMU 192); Stabilization room; 24-hour urgency care units (UPA) and hospital emergency doors;	SAMU 192: Available Emergency Care Centers: SCCD; HNSS Fire Department	Maintain the service
Transitory residential care	Shelter units; Residential care services;	There is no agreement	Open in 2013, the Child/Youth and Adult Reception Unit; Implement in 2013 Therapeutic Residential Service modality 2 (4 to 10 residents);
Hospital care	Mental health beds in general hospitals (clinics or pediatrics); Specialized wards in general hospitals;	5 beds at SCCD (Santa Casa de Caridade de Diamantina)	Maintain the service
Deinstitutionalization strategies	Therapeutic residential services; Back home program;	2 users enrolled in Back Home Program	2 users enrolled in Back Home Program
Psychosocial rehabilitation strategies	Work and income generation initiatives; Empowerment of users and family members;	Users association	Users association

Fonte: Authors.

Drawing upon the guidelines that constitute the operation of the Brazilian Unified Health System (SUS), the municipality of Diamantina, MG, has shown weakened areas of concern, leading to challenges in delivering care based on SUS principles. According to Luzio and L'Abbate (2006), since the implementation of the SUS, when many municipalities across the country sought to actualize the constitutional rights of users in all healthcare sectors, significant difficulties were observed in implementing both the general guidelines of healthcare reform and psychiatric reform.

The training of health care professionals and their significance in implementing, maintaining, and developing SUS can be considered essential and strategic. During their training, these professionals develop not only skills and knowledge but also the values and attitudes that accompany them in their professional practices.

The current Brazilian political and mental healthcare landscape, with its challenges and prospects, faces issues primarily related to difficulties in service management. These include frequent readmissions, a limited number of available services and equipment, high user demand, disarray in the psychosocial care network, and a shortage of qualified human resources to staff these services (JÚNIOR et al., 2016).

In an article by Wenceslau and Ortega (2015), which offers a theoretical analysis of the integration of mental health into primary care from the perspective of Global Mental Health (GMH) goals and strategies with international perspectives and the Brazilian scenario, the authors point out that individuals with mental disorders require healthcare systems that meet their care needs using the best available scientific foundations.

The academic production gathered by GMH shows that these psychosocial and pharmacological resources are cost-effective and should be accessible worldwide. Achieving this goal in a shorter time frame and in a sustainable manner is only possible through a strong primary care system integrated with an organized mental health network and specialized resources as the cornerstone of mental health care (WENCESLAU and ORTEGA, 2015).

The same authors cite that the international literature affirms that integration is the main global strategy to expand access to mental health services, presenting evidence demonstrating the advantages and feasibility of this model. At the same time, there is a repeated need for more robust and detailed studies on ongoing experiences, particularly demonstrating the epidemiological impact, favorable clinical outcomes, cost-effectiveness, and solutions to the cultural challenges involved.

However, the analysis of the main ordinances and technical guidelines from the Ministry of Health on this topic indicates that the SUS recognizes the fundamental role of primary care in mental healthcare. However, the limits of competence between primary and Psychosocial Care Centers (CAPS) are not clearly established, resulting in a dual entry point in the system for this type of demand. Furthermore, mental health support through the Family Health Support Centers (NASF) is the primary mechanism, better substantiated in ordinances, for qualifying the Family Health Strategy (ESF) for this service. However, this raises doubts about whether this should be the only or even the best way to promote this qualification (WENCESLAU & ORTEGA, 2015).

Eugenio (2010) concluded that there is evidence in the international literature that healthcare networks can improve service quality, health outcomes, user satisfaction, and reduce healthcare system costs when they are integrated. Evidence also suggests that integrating healthcare managers and service providers improves cooperation between them, pays more attention to case management, encourages the use of information technology, and has an impact on healthcare costs, particularly in mental health.

4 FINAL CONSIDERATIONS

The pursuit of understanding the construction of Brazilian Psychiatric Reform to the present day, extending to the municipality of Diamantina, allows us to envision both achievements and weaknesses. Psychiatric Reform is understood to have solidified as a public policy; however, the establishment of the Psychosocial Care Network (RAPS) presents itself as a complex task. For continuous and comprehensive care, it is of utmost importance for professionals to comprehend their

purposes and functionalities. In this manner, we can advance and consolidate psychosocial care, highlighting limited user engagement at the national stage.

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REFERENCES

AMARANTE, P. Loucos pela vida: A trajetória da reforma Psiquiátrica no Brasil. Rio de Janeiro: Fiocruz, 1998.

AMARANTE, P. Uma aventura no manicômio: a trajetória de Franco Basaglia. História, Ciências e Saúde. Manguinhos, v. 1, n. 1, p. 61-77, 1994.

AMSTALDEN, A.; PASSOS, E. A reforma psiquiátrica brasileira e a política de saúde mental. Portal do Centro Cultural do ministério da Saúde, Brasília, [2008]. Disponível em: http://www.ccs.saude.gov.br/VPC/reforma.html Acesso em: 15 ago. 2016.

CEDRAZ, A., DIMENSTEIN, M. Oficinas terapêuticas no cenário da Reforma Psiquiátrica: modalidades desinstitucionalizantes ou não? Revista Mal-Estar e Subjetividade. Fortaleza, v. 5, n. 2, p. 300-27, 2005. Disponível em: http://pepsic.bvsalud.org/pdf/malestar/v5n2/06.pdf . Acesso em: 15 ago. 2016.

COSTA, J. F. História da Psiquiatria no Brasil. 4. ed. Rio de Janeiro: Editora Xenon, 1985.

DESVIAT, M. Reforma Psiquiátrica. Rio de Janeiro: Editora Fiocruz, 1999.

FOULCAULT, M. História da Loucura na Idade Clássica. São Paulo: Editora Perspectiva, 1972.

MINAS GERAIS, Secretaria Estadual de Saúde. Atenção em saúde mental: Linha Guia de Saúde Mental. Belo Horizonte: [s.n.], 2006.

BRASIL. Constituição Federal da República Federativa do Brasil: texto constitucional promulgado em 5 de outubro de 1988, com as alterações determinadas pelas Emendas Constitucionais de Revisão nos 1 a 6/94, pelas Emendas Constitucionais nos 1/92 a 91/2016 e pelo Decreto Legislativo no 186/2008. Brasília: Senado Federal, 2016.

ORGANIZAÇÃO MUNDIAL DE SAÚDE. ORGANIZAÇÃO PANAMERICANA DE SAÚDE. Declaração de Caracas. Conferência Regional para a Reestruturação da Atenção Psiquiátrica na América Latina no Contexto dos Sistemas Locais de Saúde (SILOS). Caracas: OMS/OPAS; 14 nov. 1990.

Understanding the Process of Illness in Childhood: Exploring Meanings for Health Promotion

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ABSTRACT

The diagnosis of childhood cancer changes the lives of children and their families. Hospitalization in pediatric oncology presents challenges for the health team, which seeks to promote an environment in which children feel safe and their biopsychosocial needs are met. Thus, the objective was to understand, in the specialized literature, the meanings of the disease process for the child and, based on this, to seek ways to improve this process through health promotion. This is an integrative literature review, using the Lilacs and Medline databases, with the Health Sciences Descriptors: "child", "neoplasia" and "health promotion". As inclusion criteria, the study focused on articles involving the research theme, available in full in full, published between 2006 and 2016, in Portuguese, English and Spanish. Those in the form of monographs, theses, dissertations and annals of papers presented at events were excluded. The search for the analysis material resulted in a total of 214 articles, and ten articles were selected according to the inclusion criteria. Of the ten articles, eight focused on health promotion actions and of these eight, five addressed humanization in health as the main strategy. The diagnosis provokes several emotional reactions in the parents, in the child and in all those inserted in their context. Another action for health promotion is to work with play, which brings benefits to the child and to the treatment, serving as a strategy to cope with hospitalization. With regard to the family, the literature has indicated priorities for research in the area on experiences with the disease. After the review, it can be seen that the literature is still scarce regarding the child, because the child's perspective in relation to the disease and diagnosis is little addressed. The synthesis of the knowledge produced by the present study provides a framework of empirical evidence that allows us to affirm that the effort to understand the experiences and challenges experienced by pediatric patients and their family caregivers can help in the organization of comprehensive care in this delicate stage of treatment.

Keywords: Health Promotion, Child, Cancer, Public health.

1 INTRODUCTION

Childhood cancer is a group of several diseases that have in common the uncontrolled proliferation of abnormal cells and that can occur anywhere in the body. Unlike adult cancer, childhood cancer usually affects the cells of the blood system and the supporting tissues. Pediatric cancer represents only a small percentage (approximately 3%) of adult cancer. Because they are predominantly embryonic in nature, tumors in children and adolescents are made up of undifferentiated cells, which generally provides a better response to current treatments. The causes of pediatric cancer are unknown, however, a small number of cancer cases in children and adolescents (about 10%) are due to genetic or hereditary abnormalities (BRASIL, 2023).

Childhood cancer is relatively uncommon and generally has a good prognosis, with 5-year survival rates of approximately 80% in high-income countries (NAKATA et al., 2018*) and 60-72% in low- and middle-income countries (ZHENG* et al., 2015). It is believed that 70% to 80% of children diagnosed with neoplasms can be cured, as long as it is early (BRASIL, 2016).

The diagnosis of childhood cancer completely changes the lives of children and their families, as they are suddenly inserted into the hospital context - an unfamiliar environment - surrounded by strangers and subjected to invasive and painful exams (MENEZES *et al*., 2007). The authors also mention that, no matter the age of the child and their degree of understanding of the world around them, it is common for them to be able to recognize when something serious is occurring. Therefore, the torment of children with cancer may be associated not only with the disease, but also with separation from their routine and family environment.

That is why, despite all the advances that have taken place in medicine, having a higher cure rate than many other types of cancer, the diagnosis of cancer in children generates a series of feelings, anguish, depression, fear, shame and panic, because the disease is still very stigmatized, mainly related to death (ARRUDA-COLLI; SANTOS, 2015).

Hospitalization in pediatric oncology presents challenges for the health team itself, which seeks to promote an environment in which children feel safe and in which their physical and psychosocial needs are met (SILAVUTKAN, 2012). According to Bradding and Horstman (1999), they emphasize that health professionals are constantly looking for approaches that enable children to communicate their demands, so that their perspectives are taken into account when they are ill, thus allowing them to play an active role as facilitators during the therapeutic process.

According to Anders and Souza (2009), throughout their existence, human beings go through phases of adjustment and, when confronted with an illness, the process of illness can be seen as a rupture in their routine and way of being. In the same way, the child, when experiencing the pathological process, needs to develop control to deal with the consequences of the disease.

Thus, the objective was to understand, in the specialized literature, the meanings of the disease process for the child and, based on this, to seek – through health promotion – ways to improve this process for the child.

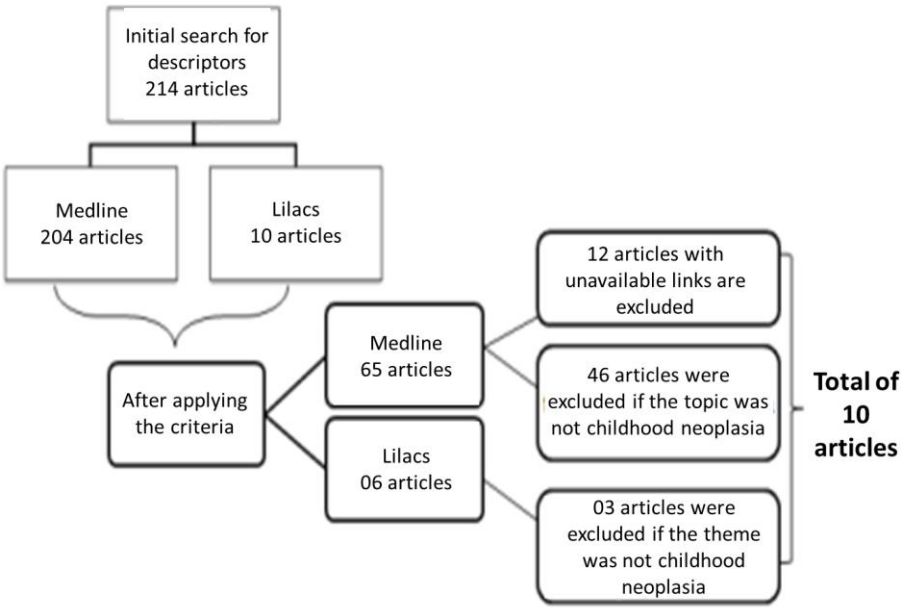
2 METHODOLOGY

This is an integrative literature review, whose guiding question was: "What is the meaning of the disease process for children with cancer? How could I study the significance of cancer for children under the age of seven?"

For the construction of this research, a literature review was carried out, searching the Lilacs and Medline databases, through the descriptors selected from the Health Sciences Descriptors (DECS) "child", "neoplasia" and "health promotion". As inclusion criteria, the study focused on scientific articles that involved the research theme, that were fully available electronically, that were published between 2006 and 2016, in Portuguese, English and Spanish. Works that did not fit the aforementioned criteria were excluded, as well as monographs, theses, dissertations and annals of papers presented at events.

The search for the analysis material resulted in a total of 214 articles. Applying the inclusion and exclusion criteria, a total of 61 articles were obtained, which, after reading the abstracts, resulted in a total of ten articles. These were read for the elaboration of the review of the present research project.

Figure 01 - Flow of selection, inclusion and exclusion of available scientific articles.



Source: The authors (2023).

During the search, it was possible to notice that the scientific articles dealt more specifically

with the suffering and perception of the parents about the child's disease or the professionals responsible for the child's care, that is, the articles sought to promote the health of the caregiver and the family, but few addressed the sick child as the focus of health promotion.

Of the ten articles, eight focused on health promotion actions and of these eight, five addressed humanization in health as the main strategy. When the disease is confirmed, the first impact is felt by family members. The diagnosis provokes several emotional reactions in the parents, in the child and in all those inserted in their context. Cancer poses a threat to the child and his/her family, affecting the family unit and causing an imbalance (FERMO et al, 2014). According to Maranhão *et al*. (2011) The work of the nursing team with pediatric cancer patients and their families should consist not only of care that involves the planning of interventions, application of technical knowledge, but also of care that involves the entire biopsychosocial context of the child, seeing him as an integral being, who at that moment goes through contradictory feelings.

Once again, the training of the professional is observed because, according to Malta and Shall (2012), the training of health professionals has been based on the use of conservative (or traditional) methodologies, in which the body is separated from the mind, the reason from the feeling, that is, because of this, questions arise about the profile and essence of the trained professional, focused on the disease, so the need for a Health Humanization Policy was seen.

Another action for health promotion is to work with play, as it is an instrument widely used with oncological children, which brings benefits to the child and to the treatment, serving as a strategy to cope with hospitalization. Toys in the hospital should represent everyday life, such as toys for role-play, for construction, for artistic expression and games, as long as they are safe, accessible and functional. For health professionals, this type of activity allows them to observe the way the child copes with the stressful situation, processes information about the medical context and seeks to understand their diagnosis (HOSTERT; ENUMO; LOSS, 2014). And this is important for health promotion, because the child needs to be aware of the diagnosis and what its treatments are, with this he will be able to elaborate the fears and fantasies of being sick. By knowing about the disease, they will be able to put themselves in the position of an active subject and thus become more participative in its treatment (FERMO *et al*., 2014).

The area of Child Health is a field with several aspects, from physiology to child psychology, through development, anatomical immaturity, among many other topics. However, childhood cancer has emerged as a topic due to the difficulty of finding professionals who want to work, or even study, about children with cancer. It is possible to perceive, through professional experience, that children experience the entire disease process differently from an adult, and that many health professionals focus more on the disease, forgetting that there is a child there, who needs differentiated care, and that it is essential to work with health promotion to improve the quality of life of these children.

After the review, it can be seen that the literature is still scarce regarding the child, because the child's perspective in relation to the disease and diagnosis is little addressed. There is a gap in the national literature, and there are no Brazilian studies that seek to understand child coping, as well as few international studies on the subject.

3 THEORETICAL FRAMEWORK

3.1 CHILDHOOD CANCER, DIAGNOSIS AND TREATMENT

According to the National Cancer Institute (INCA) (BRASIL, 2014) for childhood cancer, there is little scientific evidence that there is a relationship between the development of the neoplasm and environmental causes. In general, etiologic factors are associated with intrauterine exposures. Regarding the main types of childhood cancers, leukemias correspond to 25% to 35% of diagnosed cases. The most common type in children is Acute Lymphoblastic Leukemia (ALL). Tumors of the nervous system affect 8% to 15% of the child population, and are considered the most frequent solid tumor among pediatric neoplasms, belonging to the second position among the most common neoplasms in Brazilian children. In developing countries, lymphomas occupy the second place, but in Brazil and most developed countries they are in the third position.

Kohlsdorf and Costa Junior (2011) refer to six types of therapies used in the treatment of cancer: chemotherapy, radiotherapy, immunotherapy, surgical treatment, hormone therapy and bone marrow transplantation. These can be chosen on an individual basis or we can use a combination (one or more therapies). The selection of the appropriate intervention should be carried out together with the attending physician, the family and the patient, taking into account the type of treatment, whether it will be curative or palliative. In addition, we consider the location, size, degree of aggressiveness of the tumor, as well as the child's age and stage of the disease.

Chemotherapy is the most widely used therapy because childhood cancer is more sensitive to it, both for palliation and cure. Chemotherapy indiscriminately affects all cells of the organisms, producing many adverse effects, causing a series of physical, emotional and social consequences, generating a period of crisis and sudden changes in feelings, lifestyle habits and daily life (ALEXANDER *et al*., 2015).

A study conducted by Soares *et al*. (2014) with cancer patients showed that adverse effects are considered one of the main limitations of treatment and that one of the main effects was psychosocial damage and self-image problems. Leading us to understand that cancer is a complex disease, which manages to unbalance all aspects of the human being and that does not distinguish race, age, color or social class.

From the diagnosis to the end of treatment, it is common for people to suffer physical and emotional damage as a result of invasive procedures and changes in their routine. According to Cohen

and Melo (2010), for the child everything is more intense, because he is still developing and building his life story. The way they will experience the disease is different from adults, since the child has a unique way of placing himself in the world. In this way, children diagnosed with cancer will face new and threatening situations.

When the disease is confirmed, the first impact is felt by family members. At this time, reactions of stress and psychological distress are observed both in patients and in their families and in all those inserted in their context (ALVES *et al*., 2016). According to Silva and Cabral (2015), the child's reaction to the diagnosis can be amplified by disease and treatment stressors, such as being away from home and their routine, since, in general, it is in the hospital that the process of diagnosis and initiation of treatment takes place. Cancer begins to pose a threat to the child and his family, affecting the family unit and causing an imbalance (FERMO *et al*., 2014).

This impact is perceived by the child who can see the worried family members, observes them through their facial expressions, speech and even in their silence. The fact is that the child's life will change rapidly and intensely. The way in which each person copes with the disease will depend on the personal and social resources available to them. However, regardless of age and cognitive ability, children realize that something bad is happening around them (DIAS *et al*. 2013).

With regard to the family, the literature has indicated priorities for research in the area, with emphasis on the need to identify families who are at risk at the time of diagnosis, their perception and experience of cancer (KAZAK *et al*., 2011). One of the reasons for this need is the finding that good family dynamics at diagnosis is a predictor of later adjustment (RODRIGUEZ *et al*., 2012).

It is important that the child knows what is happening to him/herself, that he/she receives guidance and support from the family, as well as from the health team, because it is up to these professionals to inform, clarify and provide support to the family members so that they can be able to understand and help the child, both at this stage and throughout the treatment. All of this should be said respecting the child's age, in an accessible way and avoiding medical jargon (MALTA; SHALL; MODENA, 2009).

Therefore, it is important that the child is aware of the diagnosis and what their treatments are, so that they will be able to elaborate on the fears and fantasies of being sick. By knowing about the disease, they will be able to put themselves in the position of an active subject and thus become more participative in its treatment (FERMO *et al*., 2014).

Chemotherapies, which are the most widely used therapies, are divided into cycles and the duration of treatment varies depending on the stage of the disease. The first moment is the induction phase, when the patient needs to be admitted to the hospital to receive the necessary care. After induction, comes the maintenance phase and the patient continues to be treated periodically in outpatient clinics (BRASIL, 2014).

Children on antineoplastic treatment are exposed to contexts of repeated medical procedures, side effects, interruption of school and social routine, suspension of leisure activities, changes in diet, changes in self-image, feelings of uncertainty about the evolution of treatment, periodic hospitalizations, pain, losses that impair their socialization and adversely interfere with the maintenance of their daily relationships (KARS *et al*., 2008; ALEXANDER *et al*., 2015). Becoming ambiguous, chemotherapy is necessary for both curative and palliative treatment; However, it is destructive to have to undergo such aggressive treatment.

Another therapy is radiotherapy, where radiation is used to destroy or reduce the size of the tumor, and it is possible to carry out treatment concomitantly with chemotherapy. And it causes side effects, such as: tiredness, weight loss, difficulty ingesting food, and skin reactions at the site that receives the radiation (BRASIL, 2014).

In some cases, usually of more extensive tumors, surgical treatment is indicated, but the size of the surgery will depend on the development of the disease and the condition of the child. According to Maranhão et al. (2011), it is because there are so many treatment possibilities that the way the child will experience the disease process will be directly related to the procedure used and its characteristics.

Despite the consequences of the treatment, Lanza and Valle (2014) point out that children are also able to understand the treatment process as a positive experience, as they relate it to coping and triumphing in the face of a very difficult battle against cancer. Therefore, even with all the adversities imposed by the disease, the child can develop a resilient way of dealing with the aspects that involve the disease.

3.2 HEALTH PROMOTION AND CHILDHOOD CANCER

The concept of traditional health promotion was initially defined based on the model of Leavell and Clark (1978), in the 40's, in the scheme of the Natural History of the disease, as one of the elements of the primary level of care in preventive medicine.

The modern health promotion movement emerged in Canada in May 1974, with the publication of the well-known "Lalonde Report", which had political, technical and economic motivation to face the increases in the cost of health (LALONDE, 1974). This study was conducted against the backdrop of the increasing costs of health care and the questioning of the physician-centered model in the management of chronic diseases, since the results presented were of little significance (BUSS; CARVALHO, 2009).

Through the Lalonde Report, it was identified that human biology, environment, and lifestyle were related to the main causes of morbidity and mortality in Canada; However, most of the direct health expenditures were concentrated on the organization of care. Therefore, five strategies were proposed to address the problems of the health field: health promotion, regulation, efficiency of

medical care, research and goal setting. This Report favored the holding of the First International Conference on Primary Health Care, in 1978, in Alma-Ata, with great repercussions in almost all health systems in the world (MALTA et al., 2016).

Brasil (2002) describes that in 1986, the First International Conference on Health Promotion took place, which gave rise to the Ottawa Charter, according to this document:

> Health promotion is the name given to the process of training the community to act to improve their quality of life and health, including greater participation in the control of this process. To attain a state of complete physical, mental, and social well-being [...] in this sense, health is a positive concept, which emphasizes social and personal resources as well as physical capabilities. Thus, health promotion is not the exclusive responsibility of the health sector, and goes beyond a healthy lifestyle, towards global well-being (BRASIL, 2002, p. 19).

Subsequently, other international conferences on Health Promotion were held, which reaffirmed the precepts established at the First Conference and added new issues and action strategies focused on priority areas, in order to generate healthy public policies.

According to Vassal et al (2014), the challenge is to review the primary care protocol, traditionally focused on the control of infectious diseases and malnutrition. Because childhood cancer has a great potential for cure, if the diagnosis of cancer is made in the early stages, that is, it is important to invest in early detection. It is estimated that the cure rates of tumors in childhood and adolescence reach 70% if the patient is diagnosed early and receives treatment in specialized centers (BRASIL, 2014).

Therefore, the prevention of childhood cancer is still a challenge for the future and the current emphasis in the approach to this cancer should be given to its early diagnosis and referral to quality treatment, which allows higher cure rates. It is also important to promote health throughout the disease process, from diagnosis to cure.

According to Malta and Shall (2012), childhood cancer is a public health problem and, as the survival of children affected by it increases, it is essential to direct efforts and resources to guide care for this patient and his family, at all levels of action, such as health promotion, aiming at the well-being of these children.

The work of the health team with pediatric cancer patients and their families should consist not only of care that involves the planning of interventions and the application of technical-scientific knowledge, but also of how to provide care for pediatric cancer patients and their families. (2007) reports that in addition to this knowledge, we must involve the entire biopsychosocial context of the client in order to perceive him as an integral being, full of an infinite range of contradictory feelings, we must seek to promote his health through humanized care.

In addition to the child, we have to understand that behind it, we have a family, which takes time and has difficulty accepting the diagnosis of one of their own, especially when we are dealing

with cancer. And according to Avanci *et al*. (2010) From the knowledge about the disease that the family begins to accept the diagnosis, because it is with this knowledge that they will learn to take care of the child and know how he can react. This provides security, as family members feel that they are providing good care, especially when there are visible results, that is, with an improvement in the patient's clinical condition. By working on the empowerment of this family, we will promote the health of both the child and the family members, who are in need as much as the patient.

According to Frota *et al.* (2007), a differentiated and empathetic care favors the improvement of the mood and mental and emotional well-being of hospitalized children, leading to satisfactory evolutions in their health condition. From this perspective, the humanization of care represents a vital tool for the patient's recovery, minimizing the damage and trauma of hospitalization or invasive treatments.

The constant trips to the treatment center for hospitalization, or even for outpatient care, the child is vulnerable to pain and suffering, in addition to removing him from his living environment, schools, routine and friends. This causes the child to withdraw from social and family life, which can interfere with their desire to play or talk (SILVA; CABRAL; CHRISTOFFEL, 2010). Thus, the professional should seek other methods to get closer to that child, in order to promote humanized care and health promotion.

3.3 CHILDREN'S DRAWING

In order to broaden the view of the theoretical foundation of the theme under study and to strengthen the real meaning of falling ill for children with cancer, an approach to non-verbal communication was also used, with a focus on children's drawing.

For Mèredieu (2004), children's drawing is like a language with its own vocabulary and syntax. As early as 1981, Hammer pointed out that, through drawing, children convey things that they would not be able to express with words. Even if they were aware of the feelings that mobilize them, the author understands drawing as a phenomenon that should be seen not only as a projection of something repressed, but, above all, as a way of placing the internal experience in the external world.

To interpret a child's drawing is to explain what is obscure, translating it into an understandable language, extracting from the drawing a meaning hidden both to the child's understanding and to the adults around him, transcribing this latent meaning into a verbal language. Drawing is the most eloquent, immediate, and simplest method to investigate a child's humorous, behavioral, and character traits, as well as their intrapsychic conflicts, thus overcoming their difficulty in talking about themselves and exposing their problems (ARFOUILLOUX, 1983).

The availability to share the feelings and doubts of sick children seems to be a great challenge for health professionals and family members. It can be assumed that the great concern of the adult is

to face and deal with his own feelings aroused by this situation, which can lead to a vacuum between the sick child and the adults, leading the minor not to share his fears and doubts about his disease and hospitalization (KOHLSDORF; COSTA JUNIOR, 2011).

In an attempt to understand the feelings of children who are going through a process of becoming ill, Freitas (2008) conducted a research, whose main objective was to verify cognitive and emotional aspects in children through the drawing of the human person and the drawing of the hospitalized person, in order to verify which of the two forms of drawing the child was able to express himself better. The research concluded that the design of the hospitalized person made it possible to obtain better data regarding the child's understanding of his clinical condition, as well as the emotions that emerge from it.

Another example of research developed was the one carried out by Gabarra (2005) with children in a situation of hospitalization, which used free drawings. The objective of this study was to investigate children's understanding of their disease in general and its specific aspects, such as treatment, hospitalization and medication. It was found that the children understood the diseases in general, and their own disease, based on their experiences with becoming ill, with hospitalization and from other events in their lives.

As it was possible to perceive, children's drawing and its use in the hospital or outpatient environment are already considered relevant by several authors, being an instrument used in research that aims, in general, to understand the representations constructed by the child and his feelings.

According to Piaget (2011), there are two meanings for the term "representation", in a broader sense, which he called conceptual representation, it is confused with thought, that is, with all intelligence that is based on a system of concepts and, in a stricter sense, he called symbolic representation that refers to mental images, that is, to the symbolic memories of absent reality. They are related to each other, because while the image is a concrete symbol, the concept is more abstract.

Piaget distinguished five representative conducts, which he called the development of the symbolic function. According to the author, they appear at about the same time, but he has enumerated them in ascending order of complexity. The first of these is deferred imitation, in which the child imitates a person's behavior when the person is no longer present. It is the beginning of the appearance of a differentiated signifier. Secondly, there is the symbolic game, in which the child plays make-believe, using imitative gestures with objects, which become symbolic because they are given some meaning. Thirdly, there is the drawing or the graphic image, which is initially a bridge between the symbolic game and the mental image. Up to about eight or nine years old, children draw what they know and not what they see. Fourthly, there are mental images, which are internalized representations. They are different from both perceptions and mental operations, for images do not deal with concepts, but with objects as such, and with all perceptual experience passed on to the subject. Finally, there is

the verbal evocation of past actions through language. Then comes the ability to verbalize events.

Drawing, a semiotic manifestation that emerges in the symbolic period, evolves together with the development of cognition. On the one hand, it shares more intimately the phases of the evolution of perception and mental image, subordinating itself to the laws of conceptualization and perception. (PIAGET, 1975).

According to Piaget (1975), children's drawing goes through phases, according to the child's development. For him, drawing is preceded by doodling, the initial phase of graphics. Similarly to playing, it is initially characterized by the exercise of action. It is part of the sensory-motor phase (zero to two years) and part of the pre-operational phase (two to seven years), going approximately up to three or four years. At this stage, the child says what he is going to draw, but there is no fixed relationship between the object and its representation. So she can say that a square is a heart, and before she finishes the drawing, say that it's a dog.

Doodle can be divided into: Doodle Clutter and Doodle. The disordered movements are wide and disordered, there is no concern with the preservation of the features. On the other hand, the Ordinate Ordinate, longitudinal and circular lines appear, and there is a beginning to be an interest in shapes.

Soon after, there is the phase called pre-schematism, which occurs in the middle of the pre-operational phase, usually going until the age of seven when the relationship between drawing, thought and reality is discovered. It is observed that the elements are dispersed and are not related to each other.

Next comes the schematism phase, which is part of the concrete operations phase (seven to ten years). It begins to construct different shapes for each category of object. At this stage, two major changes emerge: the use of the baseline and the discovery of the color-object relationship. It already has a defined concept regarding the human figure, however some changes may arise, such as: exaggerations, omissions, among others.

The next phase is realism, which usually arises at the end of concrete operations, having a greater awareness of sex and begins a pronounced self-criticism. In space, it discovers the plane and the superposition, but abandons the baseline. Geometric shapes appear, along with greater rigidity and formalism.

Pseudo-naturalism comes next, it is part of the phase of abstract operations (ten years onwards). It is the end of art as a spontaneous activity and many give up drawing at this stage of development. He begins the investigation of his own personality, transferring to paper his anxieties and anxieties, characteristic of the beginning of adolescence. Realism, objectivity, depth, subjective space and the conscious use of color appear a lot in the drawings.

It is possible to see that in the continuity of the development process, the movement of accommodation prevails, that is, there is more and more approximation to the real and concern with

the similarity of the object represented. For this reason, according to Piaget (1975), the child draws less what he sees and more what he knows. When drawing, she conceptually elaborates objects and events. Hence the importance of studying the process of construction of the drawing together with the verbal utterance given to us by the researched.

4 FINAL THOUGHTS

As final recommendations, this research points to the need for more studies on the subject, with the inclusion of more participants, from different contexts and health services. Updating hospital data and public health databases would make it easier to recruit participants. Above all, the findings of the present study reinforce the need for health services to offer follow-up of family members in the postmortem period, following the recommendations of the palliative care guidelines recommended by the World Health Organization.

In view of the guiding question assumed in this review, the present study allowed us to explore the knowledge produced on this theme in the national and international context. In general, the analyzed studies offered a panoramic view of the topics investigated in the context of recurrence in Pediatric Oncology, with regard to the psychosocial repercussions of the experience of the patient and their families.

Considering the low number of publications selected in this review, it is clear that further research is still needed to shed light on the theme. Some studies have pointed out the difficulties of parents in sharing their experience in a moment of pain, apprehension and emotional unavailability as a justification for not participating in research, suggesting barriers that permeate the study of the theme. On the other hand, the opportunity for emotional expression was also pointed out as a potential benefit of participating in studies of this nature. Providing family members with a safe and comfortable environment can be important to favor the development of investigations during the crisis situation experienced by the family that has a child with cancer recurrence.

A limitation to be highlighted in the literature reviewed concerns the quality of the evidence provided. The studies found are descriptive (not experimental) or with a qualitative approach. Another limitation that can be pointed out is that the limited number of studies originating in Latin American countries may have led to little exploration of regional aspects. However, studies developed in eight countries were included, which allowed for a global look at the subject. Future studies should explore in more depth the experience of pediatric patients in the face of cancer recurrence, as well as the interaction of the patient-caregiver dyad, dimensions that are still little explored in the literature, in order to favor the understanding of the psychosocial aspects involved and to better define the care strategies to be implemented.

The systematization of the findings favored the delimitation of an overview of the knowledge already produced about the psychosocial impact, emotional reactions and feelings experienced by children and their families in the face of the diagnosis and treatment of cancer recurrence, focusing on the stressors and their implications for quality of life and coping. It is believed that the synthesis of the knowledge produced by this integrative review provides a framework of empirical evidence that allows us to affirm that the effort to understand the experiences, difficulties and challenges experienced by pediatric patients and their family caregivers can help in the organization of comprehensive care in this delicate stage of treatment.

REFERENCES

ANDERS, J. C.; SOUZA, A. I. J. Crianças e adolescentes sobreviventes ao câncer: Desafios e possibilidades. Ciência Cuidado e Saúde, [*s. l.*], v. 8, n. 1, p. 131-137, 2009. DOI: https://doi.org/10.4025/cienccuidsaude.v8i1.7788. Disponível em: https://periodicos.uem.br/ojs/index.php/CiencCuidSaude/article/view/7788. Acesso em: 12 jul. 2023.

ARFOUILLOUX, J. C. A entrevista com a criança: a abordagem da criança através do diálogo, do brinquedo e do desenho. 3. ed. Rio de Janeiro: Zahar, 1983.

ALEXANDER, S. *et al*. Classification of treatment-related mortality in children with cancer: a systematic assessment. The Lancet Oncology, [*s. l.*] v. 16, n. 16, p. 604-610, 2015. DOI: https://doi.org/10.1016/S1470-2045(15)00197-7. Disponível em: https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(15)00197-7/fulltext. Acesso em: 29 jun. 2023.

ALVES, K. de M. C. *et al*. A vivência dos pais da criança com câncer na condição de impossibilidade terapêutica. Texto e Contexto Enfermagem, [*s. l.*], v. 25, n. 2, p. 01-09, 2016. DOI: https://doi.org/10.1590/0104-07072016002120014. Disponível em: https://www.scielo.br/j/tce/a/sbvdvXChgtDXTw9yG43GRFD/?format=pdf&lang=pt. Acesso em: 29 jun. 2023.

ARRUDA-COLLI, M. N. F.; SANTOS, M. Aspectos psicológicos da recidiva em Oncologia Pediátrica: uma revisão integrativa. Arquivos Brasileiros de Psicologia, [*s. l.*], v. 67, n. 3, p. 75-93, 2015. Disponível em: http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1809-52672015000300007. Acesso em: 29 jun. 2023.

AVANCI, B. S. *et al*. Nursing care for children submitted to chemotherapy. Revista de Pesquisa Cuidado é Fundamental Online, [*s. l.*], v. 2, n. 2, p. 787-796, 2010. Disponível em: http://www.seer.unirio.br/index.php/cuidadofundamental/article/view/520. Acesso em: 29 jun. 2023.

BRADDING, A.; HORSTMAN, M. Using the write and draw technique with children. European Journal of Oncology Nursing, [*s. l.*], v. 3, n. 3, p. 170-175, 1999. DOI: https://doi.org/10.1016/S1462-3889(99)80801-1. Disponível em: https://www.ejoncologynursing.com/article/S1462-3889(99)80801-1/pdf. Acesso em: 12 jul. 2023.

BRASIL. Ministério da Saúde. Instituto Nacional de Câncer. Câncer da criança e adolescente no Brasil: dados dos registros de base populacional e de mortalidade. Rio de Janeiro: INCA, 2008. *E-book*. Disponível em: http://bvsms.saude.gov.br/bvs/publicacoes/cancer_crianca_adolescente_brasil.pdf. Acesso em: 25 jun. 2023.

BRASIL. Ministério da Saúde. Instituto Nacional de Câncer. Diagnóstico precoce do câncer na criança e no adolescente. Rio de Janeiro: INCA, 2014. *E-book*. Disponível em: https://www.inca.gov.br/sites/ufu.sti.inca.local/files/media/document/diagnostico-precoce-na-crianca-e-no-adolescente.pdf. Acesso em: 25 jun. 2023.

BRASIL. Ministério da Saúde. Instituto Nacional de Câncer. Incidência, mortalidade e morbidade hospitalar por câncer em crianças, adolescentes e adultos jovens no Brasil: informações dos registros de câncer e do sistema de mortalidade. Rio de Janeiro: INCA, 2016. *E-book*. Disponível em: https://www.inca.gov.br/sites/ufu.sti.inca.local/files/media/document/incidencia_mortalidade_morbidade.pdf. Acesso em: 25 jun. 2023.

BRASIL. Instituto Nacional do Câncer. Tipos de câncer: Câncer infantojuvenil. Gov BR, 2023. Disponível em: https://www.gov.br/inca/pt-br/assuntos/cancer/tipos/infantojuvenil. Acesso em: 11 jul. 2023.

BUSS, P. M.; CARVALHO, A. I. Desenvolvimento da Promoção da Saúde no Brasil últimos vinte anos (1988-2008). Ciência e Saúde Coletiva, [*s. l.*], v. 14, n. 6, p. 2305-2316, 2009. DOI: https://doi.org/10.1590/S1413-81232009000600039. Disponível em: https://www.scielo.br/j/csc/a/D65mRPV5fD5yGcMswW4dszQ/?lang=pt. Acesso em: 29 jun. 2023.

BRASIL. Ministério da Saúde. Secretaria de Políticas de Saúde. Projeto Promoção da Saúde. As Cartas da Promoção da Saúde. Brasília: Ministério da Saúde, 2002. *E-book*. Disponível em: https://bvsms.saude.gov.br/bvs/publicacoes/cartas_promocao.pdf. Acesso em: 11 jul. 2023.

COHEN, R. H. P; MELO, A. G. S. Entre o hospital e a escola: o câncer em crianças. Estilos da Clínica, São Paulo, v. 15, n. 2, p. 306-325, 2010. Disponível em: http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1415-71282010000200003. Acesso em: 29 jun. 2023.

DIAS, J. de J. *et al*. A experiência de crianças com câncer no processo de hospitalização e no brincar. Revista Mineira de Enfermagem, Belo Horizonte, v. 17, n. 3, p. 608-613, 2013. Disponível em: http://www.revenf.bvs.br/pdf/reme/v17n3/v17n3a10.pdf. Acesso em: 29 jun. 2023.

FERMO, V. C. *et al*. O diagnóstico precoce do câncer infanto-juvenil: o caminho percorrido pelas famílias. Escola Ana Nery Revista de Enfermagem, Rio de Janeiro, v. 18, n. 1, p. 54-59, 2014. DOI: https://doi.org/10.5935/1414-8145.20140008. Disponível em: https://www.scielo.br/j/ean/a/95kDKGxKb5K6dHD8stmDFkH/?format=pdf&lang=pt. Acesso em: 29 jun. 2023.

FREITAS, P. G. O desenho da figura humana e o desenho da pessoa doente na avaliação psicologia de crianças hospitalizadas. 2008. Dissertação (Mestrado em Psicologia) - Universidade de São Paulo, São Paulo, 2008.

FROTA, M. A. *et al*. O lúdico como instrumento facilitador na humanização do cuidado de crianças hospitalizadas. Cogitare Enfermagem, [s. l.], v. 12, n. 1, p. 69-75, 2007. DOI: http://dx.doi.org/10.5380/ce.v12i1.8270. Disponível em: https://revistas.ufpr.br/cogitare/article/view/8270/5781. Acesso em: 29 jun. 2023.

GABARRA, L. M. Crianças hospitalizadas com doenças crônicas: a compreensão da doença. 2005. Dissertação (Mestrado em Psicologia) – Universidade Federal de Santa Catarina, Florianópolis, 2005.

HAMMER, E. F. Aplicações clínicas dos desenhos projetivos. Rio de Janeiro: Interamericana, 1981.

HOSTERT, P. C. C; ENUMO, S. R. F; LOSS, A. B. M. Brincar e problemas de comportamento de crianças com câncer de classes hospitalares. Revista Psicologia: Teoria e Prática, São Paulo, v. 16, n. 1, p. 127- 140, 2014. DOI: http://dx.doi.org/10.15348/1980-6906/psicologia.v16n1p127-140. Disponível em: http://pepsic.bvsalud.org/pdf/ptp/v16n1/11.pdf. Acesso em: 29 jun. 2023.

KOHLSDORF, M; COSTA JUNIOR, A. L. Cuidadores de crianças com leucemia: exigências do tratamento e aprendizagem de novos comportamentos. Estudos de Psicologia, [*s. l.*], v. 16, n. 3, p. 227-234, 2011. DOI: https://doi.org/10.1590/S1413-294X2011000300004. Disponível em: https://www.scielo.br/j/epsic/a/xJzR7T6DjGypFtDmTwmbLvC/?format=pdf&lang=pt. Acesso em: 29 jun. 2023.

KARS, M. C. *et al*. Being there: parenting the child with acute lymphoblastic leukemia. Journal of Clinical Nursing, [s. l.], v. 17, n. 12, p. 1553-1562, 2008. DOI: https://doi.org/10.1111/j.1365-2702.2007.02235.x. Disponível em: https://pubmed.ncbi.nlm.nih.gov/18482117/. Acesso em: 29 jun. 2023.

KAZAK, A. E. *et al*. Association of psychosocial risk screening in pediatric cancer with psychosocial services provide. Psycho-Oncology, [*s. l.*], v. 20, n. 7, p. 715-723, 2011. DOI: https://doi.org/10.1002/pon.1972. Disponível em: https://onlinelibrary.wiley.com/doi/10.1002/pon.1972. Acesso em: 29 jun. 2023.

LALONDE, M. A new perspective on the health of Canadians: a working document. Ottawa: Government of Canada, 1974.

LANZA, L. F.; VALLE, E. R. M. V. Criança no tratamento final do câncer e seu olhar para o futuro. Estudos de Psicologia, [*s. l.*], v. 31, n. 2, p. 289-297, 2014. DOI: https://doi.org/10.1590/0103-166X2014000200013. Disponível em: https://www.scielo.br/j/estpsi/a/rkpDx59Mdzr3kWWtRBmcbPm/?lang=pt. Acesso em: 29 jun. 2023.

LEAVELL, H.; CLARK, G. G. Medicina preventiva. Rio de Janeiro: Mcgraw-Hill do Brasil, 1978.

MALTA, D. C. *et al*. Política Nacional de Promoção da Saúde (PNPS): capítulos de uma caminhada ainda em construção. Ciência & Saúde Coletiva, [*s. l.*], v. 21, n. 6, p. 1683-1694, 2016. DOI: https://doi.org/10.1590/1413-81232015216.0757201. Disponível em: https://www.scielo.br/j/csc/a/pWG9W7grqFzzQGszmDKzvrb/abstract/?lang=pt. Acesso em: 29 jun. 2023.

MALTA, J. D.; SHALL, V. T. Instrumento para a humanização do cuidado do câncer infanto juvenil. Pediatria moderna, [*s. l.*], v. 48, n. 2, p. 74-78, 2012. Disponível em: https://www.arca.fiocruz.br/handle/icict/7723. Acesso em: 29 jun. 2023.

MALTA, J. D.; SHALL, V. T.; MODENA, C. M. O momento do diagnóstico e as dificuldades encontradas pelos oncologistas pediátricos no tratamento do Câncer em Belo Horizonte. Revista Brasileira de Cancerologia, [*s. l.*], v. 55, n. 1, p. 33-39, 2009. Disponível em: https://rbc.inca.gov.br/index.php/revista/article/view/1674. Acesso em: 29 jun. 2023.

MALTA, D. C. *et al.* Política Nacional de Promoção da Saúde (PNPS): capítulos de uma caminhada ainda em construção. Ciência & Saúde Coletiva, [*s. l.*], v. 21, n. 6, p. 1683-1694, 2016. DOI: https://doi.org/10.1590/1413-81232015216.07572016. Disponível em: https://www.scielo.br/j/csc/a/pWG9W7grqFzzQGszmDKzvrb/?format=pdf&lang=pt. Acesso em: 29 jun. 2023.

MARANHÃO, T. A. *et al*. A humanização no cuidar da criança portadora de câncer: fatores limitantes e facilitadores. Journal of the Health Sciences Institute, [*s. l.*], v. 29, n. 2, p. 106-109, 2011. Disponível em: https://repositorio.unip.br/wp-content/uploads/2020/12/V29_n2_2011_p106-109.pdf. Acesso em: 29 jun. 2023.

MENEZES, C. N. B. *et al*. Câncer infantil: Organização familiar e doença. Revista Mal-Estar e Subjetividade, [*s. l.*], v. 7, n. 1, p. 191-210, 2007. Disponível em: http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1518-61482007000100011. Acesso em: 12 jul. 2023.

MEREDIEU, F. O desenho infantil. 10. ed. São Paulo: Cultrix, 2012.

PIAGET, J. A formação do símbolo na criança. 2. ed. Rio de Janeiro: Zahar, 1975.

PIAGET, J. Seis estudos de Psicologia. 25. ed. Rio de Janeiro: Forense Universitária, 2011.

RODRIGUEZ, E. M. *et al*. Cancer-related sources of stress for children with cancer and their parents. Journal of Pediatric Psychology, [*s. l.*], v. 37, n. 2, p. 185–197, 2012. DOI: https://doi.org/10.1093/jpepsy/jsr054. Disponível em: https://pubmed.ncbi.nlm.nih.gov/21841187/. Acesso em: 29 jun. 2023.

SILAVUTKAN, M. Children hospital design in children picture. Procedia: Social and Behavioral Sciences, [*s. l.*], v. 51, p. 110-114, 2012. DOI: https://doi.org/10.1016/j.sbspro.2012.08.127. Disponível em: https://www.sciencedirect.com/science/article/pii/S187704281203265X?via%3Dihub. Acesso em: 12 jul. 2023.

SILVA, L. F; CABRAL, I. E. O resgate do prazer de brincar da criança com câncer no espaço hospitalar. Revista Brasileira de Enfermagem, [*s. l.*], v. 68, n. 3, p. 391-397, 2015. DOI: https://doi.org/10.1590/0034-7167.2015680303i. Disponível em: https://www.scielo.br/j/reben/a/qF6yYwbyhKgQjNfbB7yftGw/?format=pdf&lang=pt. Acesso em: 29 jun. 2023.

SILVA, L. F.; CABRAL, I. E.; CHRISTOFFEL, M. M. The (im)possibilities of play for children with outpatient cancer treatment. Acta Paulista de Enfermagem, [*s. l.*], v. 23, n. 3, p. 334-340, 2010. DOI: https://doi.org/10.1590/S0103-21002010000300004. Disponível em: https://acta-ape.org/article/as-impossibilidades-de-brincar-para-o-escolar-com-cancer-em-tratamento-ambulatorial/. Acesso em: 29 jun. 2023.

SOARES, V. A. *et al*. O uso do brincar pela equipe de enfermagem no cuidado paliativo de crianças com câncer. Revista Gaúcha de Enfermagem, [*s. l.*], v. 35, n. 3, 2014. DOI: https://doi.org/10.1590/1983-1447.2014.03.43224. Disponível em: https://www.scielo.br/j/rgenf/a/5pdcScVkjbvgxty66V6CFYB/?lang=pt. Acesso em: 29 jun. 2023.

VASSAL, G. *et al*. Challenges for children and adolescents with cancer in Europe: The SIOP Europe agenda. Pediatric Blood & Cancer, [*s. l.*], v. 1, n. 9, p. 1551-1557, 2014. DOI: https://doi.org/10.1002/pbc.25044. Disponível em: https://pubmed.ncbi.nlm.nih.gov/24706509/. Acesso em: 29 jun. 2023.

SEVEN publicações acadêmicas

Steroid therapy in COVID-19 as a triggering factor for *Strongyloides stercoralis* hyperinfection

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ABSTRACT
Strongyloides stercoralis is a nematode with worldwide geographical distribution, most frequent in tropical areas, especially prevalent in areas with poor sanitary conditions. The disease caused by S. stercoralis is known as strongyloidiasis and parasitism is usually asymptomatic. Infection by this nematode may, however, present severe symptoms in hosts with immune system deficiencies. The aim of this research is to investigate, through a review of current scientific literature, the treatment of severe COVID-19 with immunosuppressants as a triggering factor for Strongyloides stercoralis hyperinfection. There are scarce records in the scientific literature on Strongyloides stercoralis hyperinfection consequent to treatment of COVID-19 with steroid drugs, mainly in endemic areas. We believe that this complication may be highly underestimated. The finding of eosinophilia in the blood count of patients after receiving immunosuppressive therapy during COVID-19 corticoid treatment is an important marker for the possibility of Strongyloides stercoralis hyperinfection and should prompt laboratory studies for nematode screening, mainly serology and PCR.

Keywords: Strongyloides stercoralis, Hyperinfection, COVID-19.

1 INTRODUCTION

Strongyloides stercoralis is a nematode with worldwide geographical distribution, more frequent in tropical zones, especially prevalent in areas with poor sanitary conditions. The disease caused by *Strongyloides* stercoralis is known as strongyloidiasis, and was first described by the French physician Louis Normand in the year 1876, when he observed the nematode in the fecal material of

soldiers returning from Cochinchina, a region where Vietnam is present, naming the discovered parasite as *Anguillula stercoralis* (STREIT, 2021; RIVERA et al., 2021).

The main form of acquisition of parasitosis by *Strongyloides stercoralis* is by skin contact with soil contaminated with the infective form of the nematode. The filarioid larvae actively penetrate the skin, migrating through the bloodstream and lymphatic streams to the lungs, where they enter the alveolar sacs. On this occasion, it can cause itching and skin rash at the site of penetration. The filarioid larvae move through the respiratory tract, ascend the tracheobronchial tree toward the glottis, and are swallowed by the host. These larvae mature and transform into the adult form, parasitizing the intestinal mucosa, mainly duodenum and jejunum. Adult females produce eggs by parthenogenesis and the eggs hatch in the intestine, releasing rhabditiform larvae, which develop in the intestinal lumen. The rhabditiform larval form is eliminated in the feces, contaminating the soil, where the sexual reproduction of the nematode occurs and the evolution to the filarioid form in the environment. The duration of the cycle lasts from three to four weeks. In the parasitized individual, self-contamination may occur when rhabditiform larvae evolve into infective filarioid larvae within the human gastrointestinal tract. These larvae can penetrate the intestinal mucosa or perianal mucosa, reaching the blood or lymphatic networks and following the infective course to the lungs and again to the intestine. This peculiarity allows *Strongyloides stercoralis* to complete its evolutionary cycle without leaving the organism of its host, unlike other parasitic nematodes (PAGE et al., 2018; LUVIRA et al., 2022; CZERESNIA & WEISS, 2022; PRASAD & SAHU, 2022).

Strongyloides stercoralis *parasitism* is usually asymptomatic. Infection by this nematode can, however, present severe conditions in hosts with deficiencies in the immune system, such as in individuals undergoing immunosuppressive therapies, patients with AIDS, HTLV-1 infection, organ recipients in need of drug maintenance, cancer (mainly hematological), tuberculosis and in states of severe malnutrition. In these cases, a high number of parasites completes the reinfection cycle, causing hyperinfection or disseminated strongyloidiasis. This clinical condition causes high mortality rates, presenting signs and symptoms such as abdominal pain, nausea, vomiting, diarrhea, intestinal involvement with edema, obstructions, ulcerations and hemorrhage with the possibility of peritonitis and secondary bacterial infection; cough, dyspnea, hoarseness, pneumonia, hemoptysis, and respiratory failure. Thus, hyperinfection by *Strongyloides stercoralis* should be analyzed as a systemic disease, not just as an intestinal parasitosis, because it more broadly compromises the patient's health (AHMADPOUR et al., 2019; AMIN et al., 2019; LUVIRA et al., 2022; CZERESNIA & WEISS, 2022; PRASAD & SAHU, 2022).

Strongyloidiasis is particularly prevalent in underserved populations, with poor sanitary conditions, which allow the continuity of the cycles of infection and reinfection, whose access to health services for diagnosis and treatment are insufficient. It is estimated that there are about 370 million

people with strongyloidiasis in the world, with estimated prevalences between 10% and 40% of the population of tropical and subtropical countries (KROLEWIECKI & NUTMAN, 2019; BUONFRATE et al., 2020; LUVIRA et al., 2022), but in some regions such as Peru, Kenya, Namibia and Papua New Guinea prevalence rates may exceed 70% (CZERESNIA & WEISS, 2022). Strongyloidiasis is a highly neglected disease, and there is currently little knowledge about its actual incidence in many of the endemic areas (BUONFRATE et al., 2020; LUVIRA et al., 2022).

The COVID-19 pandemic has given rise to a number of challenges not only because of the virus, but because of the circumstances in which co-infections and latent diseases can become risk factors for patients' lives. The objective of this research is to investigate, through the review of the current scientific literature, the treatment of severe COVID-19 with immunosuppressants as a triggering factor of hyperinfection by *Strongyloides stercoralis*.

2 METHOD

The methodological design chosen for the research was that of narrative review. The reference material was obtained from the PubMed, SciELO and Google Scholar databases. The following descriptors were used as a search strategy, in various combinations: "SARS-CoV-2", "COVID-19"; "*Strongyloides*", "strongyloidiasis". The initial selection consisted of the compilation of clinical cases of *Strongyloides* hyperinfection resulting from the treatment of COVID-19 with immunosuppressants, with a time frame of publication between the year 2019 and the month of November 2022. After reading each article and case report, the pre-selected material was evaluated. Articles with incomplete data or whose diagnostic interpretation did not prove the association between treatment with immunosuppressants in COVID-19 and the development of S. *stercoralis* hyperinfection were excluded. The selected case reports were summarized in their most important clinical aspects for analysis purposes.

3 RESULT

Researchers Feria et al. (2022) reported two cases of reactivation of *Strongyloides stercoralis* in patients with COVID-19. A 44-year-old man from Bolivia who has lived in Spain for 17 years has been hospitalized with severe pneumonia from SARS-CoV-2. The patient received oxygen therapy and treatment with Dexamethasone for seven days. On the seventh day, generalized pruritus and the appearance of a skin lesion in the abdomen began, and eosinophilia was observed. Serology for *S. stercoralis was* positive for IgG and the treatment was performed with Ivermectin for two days, which resolved the skin condition. A 74-year-old Honduran woman who has lived in Spain for seven years was hospitalized with COVID-19 pneumonia. After 10 days of treatment with Dexamethasone, the patient presented with severe pruritus, predominantly in the upper extremities, and an erythematous

lesion in the periumbilical region. Serology *for S. stercoralis* was positive for IgG and treatment with Ivermectin for 10 days resulted in complete resolution of the clinical picture. After three months, the patients remained asymptomatic, but with positive IgG for *Strongyloides*.

One case of strongyloidiasis subsequent to COVID-19 was reported by Pintos-Pascual et al. (2021). The 70-year-old patient was hospitalized in Madrid, Spain, with a dry cough, fever, dyspnea and chest pain. The test was positive for SARS-CoV-2 and due to the degradation of respiratory functions, there was a need for therapy with methylprednisolone, tocilizumab and anakinra. Corticosteroid treatment lasted 30 days. One month after medical discharge, the individual had epigastric abdominal pain. The blood count revealed leukocytosis with eosinophilia. As the patient was Ecuadorian and a rural worker until 2008, there was clinical suspicion of strongyloidiasis. *Strongyloides* infection was confirmed by serological tests and coproscopies. The patient was treated with Albendazole for three days. After a few weeks with the persistence of symptoms, another coproscopy was ordered and *Strongyloides* larvae were again observed. Treatment with Ivermectin was initiated, which definitively resolved the parasitism by *Strongyloides*.

A 45-year-old Ecuadorian who had been living in Spain for twenty years was admitted with COVID-19 in respiratory failure to an emergency hospital in Madrid. Nuñez-Gómez et al (2021) describe that the patient required oxygen therapy and received Dexamethasone. The clinical history indicated that the individual had an episode of skin rash in 2018, with suspected allergy, without there being a determination of the cause. Serology for *Strongyloides was positive on the* seventh day of hospitalization and Ivermectin therapy was started on the eighth day. A few hours after the administration of Ivermectin, the appearance of diffuse macropapular skin rash with pruritus was observed. That same day, the examination of the feces revealed the presence of larvae of *S. stercoralis*. The authors point out that hyperinfection by *Strongyloides stercorarlis* occurred in the context of corticosteroid use a few days after therapy with this type of drug, but emphasize the efficacy of Ivermectin, which resolved the parasitosis in 48 hours of treatment, which was continued for a total of 14 days.

Stylemans et al. (2021) reported the clinical case of a 59-year-old man, a native of Ecuador and resident in Belgium for seven years, taken to the emergency department of a hospital in the European country with signs of severe COVID-19, confirmed through PCR testing. The patient was intubated and received drug treatment with Anakinra and Methylprednisolone for one month, with progressive improvement of viral pneumonia. At forty-nine days of hospitalization, the blood count showed eosinophilia, and the review of the patient's clinical history in previous hospitalizations revealed chronic eosinophilia. The result of serological tests *for S. stercoralis was* positive and the infestation was confirmed for the nematode by PCR of fecal sample. A single dose of Ivermectin was sufficient

to overcome the parasitosis, with the regression of eosinophilia, and after one week the patient was discharged from the hospital.

Marchese et al. (2021) reported on a 57-year-old woman in southeastern Italy who was hospitalized with typical symptoms of COVID-19. SARS-CoV-2 infection was confirmed by PCR. The patient had previously used small doses of Prednisone for the treatment of Still's Disease, The patient was treated with Hydroxychloroquine, Lopinavir/Ritonavir, Enoxaparin and Dexamethasone. On the fifth day of hospitalization, the dose of Dexamethasone was increased to 20 mg/day for six days. The clinical conditions gradually improved when on the twenty-fifth day of hospitalization the patient presented eosinophilia and reported abdominal pain and pruritus. Coproscopy revealed the presence of rhabditiform larvae of *S. stercoralis*, and IgG serology showed a titre of 1:640. Treatment with Ivermectin was initiated for four days, which resulted in the rapid decline of eosinophilia and resolution of symptoms. The patient reported, after diagnosis, that she had diffuse pruritus for the last ten years, treated with topical steroids that only partially resolved the symptoms.

A case of strongyloidiasis disseminated during treatment for COVID-19 in the United States of America was reported by Patel et al. (2021). A 72-year-old man from Nicaragua was hospitalized with dyspnea and the PCR test was positive for SARS-CoV-2 infection. The worsening of hypoxia led to hospitalization in the Intensive Care Unit, where the patient was intubated and treated with Dexamethasone and anticoagulants. The clinical picture deteriorated and tracheostomy was required. Subsequently, multidrug-resistant *Escherichia coli* pneumonia was detected, with the patient progressing to shock, being treated with vasopressors and high rates of steroids. Marked eosinophilia was observed and coproscopies revealed the presence of parasite eggs. On microscopic examination, the presence of rhabditiform larvae indicated infection by *S. stercoralis*, and the observation of bronchoalveolar lavage showed the presence of *Strongyloides larvae*. The patient was diagnosed with disseminated strongyloidiasis and treated with Ivermectin.

Alkaabba et al. (2022) described a case of strongyloidiasis after treatment of COVID-19 infection in a 76-year-old male patient hospitalized complaining of abdominal pain in the United States of America. The patient had been treated for COVID-19 two weeks earlier with the use of nasal cannula oxygen, Dexamethasone and Remdesivir for five days, as well as convalescent plasma therapy. During COVID-19, leukocytosis with eosinophilia was observed. Intestinal biopsy was performed to determine the etiology, the result of which indicated duodenitis with acute infection and necrosis, suggestive of parasitic infection. Coproscopy revealed the presence of larvae and eggs of *S. stercoralis*. The patient was treated with the antiulcer Sucralfate and two doses of Ivermectin, reporting improvement of symptoms in a few days and receiving medical discharge. The patient reported that he did not inhabit or visit areas endemic for *Strongyloides*.

Kim & Sivasubramanian. (2022) reported the case of a 63-year-old Cambodian woman admitted to a hospital in California, United States of America, with classic signs of COVID-19 and PCR-confirmed SARS-CoV-2 infection. The patient was treated with Dexamethasone, Remdesivir and Baritinicib. With the improvement in her general condition on the sixth day, she was transferred to the primary care ward. On the twenty-eighth day of hospitalization, there was worsening of the respiratory status, with fever and eosinophilia. Microscopic examination of the bronchoalveolar lavage revealed the presence of *Strongyloides* spp. larvae . Stool samples were negative for the nematode, but serology for IgG was positive, and it was decided to undergo Ivermectin therapy for 14 days. The subsequent culture of bronchoalveolar lavage was positive for *Escherichia coli*, the patient presented encephalopathy and progressed to death.

A case of strongyloidiasis after COVID-19 in a 68-year-old patient in the United States of America was presented by Lier et al. (2020). The patient, an Ecuadorian, was a rural worker in his country of origin. The individual was hospitalized with COVID-19, with structural damage to the lungs resulting from the worsening of the acute viral illness. For the treatment of the cytokine cascade, doses of methylprednisolone and tocilizumab were administered. In the first week of hospitalization, bronchoalveolar lavage culture was positive only for commensal bacteria of the respiratory tract. On the twelfth day, the blood culture was positive for *Streptococcus constellatus and* Citrobacter freundii*, and the bronchoalveolar lavage culture was positive for* Staphylococcus aureus and *Pseudomonas aeruginosa*, which guided antibiotic therapy with Ciprofloxacin, Cefazolin and Metronidazole, and the administration of Methylprednisolone was discontinued. On the nineteenth day, serpentiform trails were noticed in the chocolate agar culture medium where material obtained from bronchoalveolar lavage was sown. Microscopic observation showed the presence of larvae of *Strongyloides stercoralis*, and on the twenty-first day of hospitalization eosinophilia was observed. The treatment of parasitosis was performed with the use of Ivermectin and Albendazole. Serology for *S. stercoralis* remained positive until the twenty-eighth day of hospitalization.

A case of strongyloidiasis triggered by steroid use in the treatment of COVID-19 in Oman was described by Busaidi et al. (2022). The researchers report that a 55-year-old patient, hospitalized in April 2020 for acute SARS-CoV-2 pneumonia, received treatment with Dexamethasone for five days during hospitalization and follow-up of corticosteroid use for five weeks in the convalescence period. The following month, the patient experienced nausea, lack of appetite and weight loss of 10 kg. The first clinical suspicion was *of Enterobius vermicularis* infestation, which was treated with a single dose of Albendazole. The symptoms persisted and the examinations performed in the following week revealed eosinophilia and a picture of cholestasis. Coproscopy showed the presence *of Strongyloides stercoralis larvae and* the individual received two doses of Albendazole and two doses of Ivermectin.

After one month, the complete remission of strongyloidiasis and the extinction of symptoms were verified.

Gautam et al. (2021) described the clinical case of a 53-year-old patient in India, hospitalized due to COVID-19, who required treatment with methylprednisolone for 5 days, receiving medical discharge after two weeks. A month and a half after recovering from COVID-19, he returned to the hospital with fever, diarrhea, and abdominal discomfort. Endoscopy revealed a hiatal hernia with duodenal ulcer. Blood culture was negative, while fecal occult blood test was positive. On microscopic examination of fresh feces, rhabditiform larvae of *Strongyloides stercoralis* were observed. The ulcer was treated with Pantoprazole, while the drug plan for parasitosis was based on the use of Ivermectin and Albenzadol for two weeks. After this period, no larvae of *S. stercoralis were detected* in the feces.

A case of *Strongyloides* hyperinfection consequent to corticosteroid therapy in a patient with COVID-19 in Iran was presented by Babazadeh et al. (2022), The 70-year-old patient was seen with signs of severe COVID-19, receiving high doses of Dexamethasone for ten days. Three weeks after treatment for COVID-19, he presented to the hospital unit with chest discomfort, nausea and anorexia. Endoscopy demonstrated the presence of lesions in the duodenum. Histopathological examination showed the presence of numerous S. *stercoralis eggs* and eosinophilic infiltration in the mucosa. The patient was treated with Ivermectin for seven days and Albendazole for ten days. After this period, the symptoms disappeared.

4 DISCUSSION

The scientific literature is scarce regarding cases of reactivation of latent *Strongyloides stercoralis infection* as a consequence of the treatment of COVID-19 with immunosuppressive drugs. The signs and symptoms of hyperinfection are the same as those presented in cases of immunosuppression not linked to the context of COVID-19 and its treatment. The use of antiparasitics was effective and resolved the clinical picture in all cases where there were no additional complications to COVID-19. A recurrent factor in all cases described, expected for hyperinfection by *S. stercoralis*, is eosinophilia in these patients, in contrast to the eosinopenia present in COVID-19, in which the degree of decrease in circulating eosinophils serves as a predictive factor of the severity of acute viral disease. The diagnosis of *S. stercoralis* hyperinfection occurred between seven days and two months after corticosteroid therapy.

The phenomenon of hyperinfection by *Strongyloides stercoralis* is attributed to the loss of immune containment capacity that favors the rapid multiplication of the nematode (LUVIRA et al., 2022; CZERESNIA & WEISS, 2022; PRASAD & SAHU, 2022), or that the metabolites of steroids used in treatment can mimic ecdysteroids, substances involved in Strongyloides multiplication processes (GENTA, 1992; HERBERT et al., 2022). Hyperinfection in patients undergoing

immunosuppression has been known since before the COVID-19 pandemic, but the multiplication of the number of individuals requiring steroid therapy to contain the cytokine cascade in severe forms of COVID-19 amplifies the possibility of incidence of disseminated strongyloidiasis. The scarcity of scientific literature on the subject may indicate that hyperinfections resulting from the treatment of COVID-19 are highly underestimated. It may contribute to the lack of diagnosis of hyperinfection the similarity of some signs and symptoms in the post-COVID-19 period and in the long COVID syndrome, especially in more moderate cases. Among the coincident and most pointed symptoms for the post-COVID-19 or long-term illness period are fatigue, dyspnea, cough, fever, nausea, and digestive disorders (BANDA et al., 2020; LOPEZ-LEON et al., 2021; DESAI et al., 2022; BOGARIU & DUMITRASCO, 2022), in addition to erythema, skin rash and pruritus (CONFORTI et al., 2020; Dudani et al., 2022; MASSOD et al., 2022).

Most of the cases of Strongyloides *hyperinfection* as a consequence of the use of corticosteroids in the treatment of COVID-19 reported in the current scientific literature refer to patients living outside endemic areas. Even so, we emphasize that the possibility that hyperinfection is not diagnosed among migrants outside endemic areas is high, due to the lack of medical repertoire for health professionals unaccustomed to this parasitosis, and the non-routine performance of tests for the detection of *Strongyloides*. Byard (2019) states that the incidence and geographical area of occurrence of strongyloidiasis is increasing, especially due to the large number of migrants and refugees, with an increasing number of undiagnosed cases. Jenks et al. (2022) conducted a retrospective study of the medical history of migrant patients at a hospital in New York state, United States of America. They reported 68 migrants who had COVID-19 who also had eosinophilia and 29 who had a confirmed diagnosis for strongyloidiasis. Although the proportion of patients with these conditions was small (1.0% and 0.5%, respectively), the authors point out that the infestation by this nematode and the possibility of hyperinfection in the context of the application of steroids in the treatment of COVID-19 is underestimated due to the few serology tests for *Strongyloides* among the medical records examined. According to Asundi et al. (2019), the seroprevalence of strongyloidiasis among migrants in the world is 9 to 15-9%. This key population had a high risk of COVID-19 infection and mortality. Norberg et al. (2021) also point out that migrants from countries with a lower human development index – many of these countries endemic for *S. stercoralis* – are part of the subgroup most at risk for SARS-CoV-2 infection. In addition, vulnerabilities inherent to individuals whose migration occurs unofficially or outside of cross-border movement regulations, such as difficulties or fear of detention in accessing health services, are of particular concern in cases of hyperinfection after treatment of COVID-19, which can constitute a serious health risk to these individuals.

5 CONCLUSION

There is a paucity of records in the scientific literature on *Strongyloides stercoralis* hyperinfection consequent to the treatment of COVID-19 with steroid medications, especially in endemic areas. We believe that this complication can be highly underestimated, since it is in the same context of depletion of the immune system observed in other pathogenesis and clinical conditions known to trigger hyperinfection, notably the use of steroids. Steroid medications like Dexamethasone and Methylprednisolone are widely used in cytokine cascade containment therapy in severe COVID-19. In the context of a pandemic, with a high number of patients undergoing steroid therapy, an increased incidence of hyperinfection cases is expected in the population of individuals with chronic or asymptomatic strongoloidiasis.

The finding of eosinophilia in the blood count of patients at a time after immunosuppressive drug therapy during the treatment of COVID-19 is an important marker for the possibility of hyperinfection by *Strongyloides stercoralis* and should give rise to laboratory studies for the detection of the nematode, especially serology and PCR. We believe that the adoption of antiparasitics in COVID-19 treatment protocols when steroid use is necessary is an important measure in areas endemic for *S. stercoralis*, as well as in patients from these regions, to avoid triggering hyperinfection.

REFERENCES

AHMADPOUR, E. et al. *Strongyloides stercoralis* infection in human immunodeficiency virus-infected patients and related risk factors: A systematic review and meta-analysis. Transboundary and Emerging Diseases, v. 66, n. 6, p. 2233–2243, nov. 2019.

ALKAABBA FAHAD; LI HOLMAN; IBRAHIM FARRAH. Activating dormant strongyloidiasis secondary to COVID-19 treatment. Global Journal of Medical and Clinical Case Reports, v. 9, n. 1, p. 015–017, 1 fev. 2022.

AMIN, A. et al. *Strongyloides* Hyperinfection Syndrome: a rare but commonly fatal case. Chest, v. 155, n. 4, p. 66A, abr. 2019.

ASUNDI, A. et al. Prevalence of strongyloidiasis and schistosomiasis among migrants: a systematic review and meta-analysis. The Lancet Global Health, v. 7, n. 2, p. e236–e248, fev. 2019.

BABAZADEH, S. et al. *Strongyloides* Hyperinfection Syndrome Following Corticosteroid Therapy in a Patient with COVID-19 infection: A Case Report. Iranian Journal of Medical Microbiology, v. 16, n. 3, p. 267–270, 1 maio 2022.

BANDA, J. M. et al. Long-term patient-reported symptoms of COVID-19: an analysis of social media data. [s.l.] Infectious Diseases (except HIV/AIDS), 1 ago. 2020. Disponível em: <http://medrxiv.org/lookup/doi/10.1101/2020.07.29.20164418>. Acesso em: 15 dez. 2022.

BOGARIU, A. M.; DUMITRASCU, D. L. Digestive involvement in Long- COVID syndrome. Medicine and Pharmacy Reports, 21 dez. 2021.

BUONFRATE, D. et al. The Global Prevalence of *Strongyloides stercoralis* Infection. Pathogens, v. 9, n. 6, p. 468, 13 jun. 2020.

BUSAIDI, N. A. et al. Steroid-induced Strongyloidiasis with Cholestasis Post-COVID-19 Pneumonia. Oman Medical Journal, 2022.

BYARD, R. W. Lethal strongyloidiasis – Diagnostic and forensic issues. Journal of Forensic and Legal Medicine, v. 62, p. 103–106, fev. 2019.

CONFORTI, C. et al. Cutaneous Manifestations in Confirmed COVID-19 Patients: A Systematic Review. Biology, v. 9, n. 12, p. 449, 5 dez. 2020.

CZERESNIA, J. M.; WEISS, L. M. *Strongyloides stercoralis*. Lung, v. 200, n. 2, p. 141–148, abr. 2022.

DESAI, A. D. et al. Long-term complications of COVID-19. American Journal of Physiology-Cell Physiology, v. 322, n. 1, p. C1–C11, 1 jan. 2022.

DUDANI, P.; GUPTA, V.; VERMA, K. K. Dermatological Sequelae of COVID-19 Infection. Em: MOHAN, A.; MITTAL, S. (Eds.). Post COVID-19 Complications and Management. Singapore: Springer Nature Singapore, 2022. p. 139–158.

FERIA, L.; TORRADO, M.; ANTON-VAZQUEZ, V. Reactivación de Strongyloides stercoralis en pacientes con neumonía por SARS-CoV-2 en tratamiento con dexametasona. Medicina Clínica, v. 158, n. 5, p. 242–243, mar. 2022.

GAUTAM, D. et al. Corticosteroids in Covid-19 pandemic have the potential to unearth hidden burden of strongyloidiasis. IDCases, v. 25, p. e01192, 2021.

GENTA, R. M. Dysregulation of strongyloidiasis: a new hypothesis. Clinical Microbiology Reviews, v. 5, n. 4, p. 345–355, out. 1992.

HERBERT, D. R. et al. Is *Strongyloides stercoralis* hyperinfection induced by glucocorticoids a result of both suppressed host immunity and altered parasite genetics? Molecular and Biochemical Parasitology, v. 251, p. 111511, set. 2022.

JENKS, N. P.; DRISCOLL, B.; LOCKE, T. Strongyloidiasis Hyperinfection Syndrome in COVID-19 Positive Migrants Treated with Corticosteroids. Journal of Immigrant and Minority Health, v. 24, n. 6, p. 1431–1434, dez. 2022.

KIM, J. M.; SIVASUBRAMANIAN, G. *Strongyloides* Hyperinfection Syndrome among COVID-19 Patients Treated with Corticosteroids. Emerging Infectious Diseases, v. 28, n. 7, p. 1531–1533, jul. 2022.

KROLEWIECKI, A.; NUTMAN, T. B. Strongyloidiasis. Infectious Disease Clinics of North America, v. 33, n. 1, p. 135–151, mar. 2019.

LIER, A. J. et al. Case Report: Disseminated Strongyloidiasis in a Patient with COVID-19. The American Journal of Tropical Medicine and Hygiene, v. 103, n. 4, p. 1590–1592, 7 out. 2020.

LOPEZ-LEON, S. et al. More than 50 long-term effects of COVID-19: a systematic review and meta-analysis. Scientific Reports, v. 11, n. 1, p. 16144, 9 ago. 2021.

LUVIRA, V. et al. *Strongyloides stercoralis*: A Neglected but Fatal Parasite. Tropical Medicine and Infectious Disease, v. 7, n. 10, p. 310, 17 out. 2022.

MARCHESE, V. et al. *Strongyloides* infection manifested during immunosuppressive therapy for SARS-CoV-2 pneumonia. Infection, v. 49, n. 3, p. 539–542, jun. 2021.

MASOOD, W. et al. Pathobiology of Cutaneous Manifestations Associated with COVID-19 and their management. Viruses, v. 14, n. 9, p. 1972, 6 set. 2022.

NORBERG, P. R. B. M. et al. Migrants, asylum seekers and refugees at the context of the COVID-19: a highly vulnerable key population in pandemic times. WJPPS, v. 11, n. 2, p. 188–199, 2021.

NÚÑEZ-GÓMEZ, L.; COMECHE, B.; SUBIRATS, M. Strongyloidiasis: An Important Coinfection in the COVID-19 Era. The American Journal of Tropical Medicine and Hygiene, v. 105, n. 5, p. 1134–1135, 3 nov. 2021.

PAGE, W.; JUDD, J.; BRADBURY, R. The Unique Life Cycle of *Strongyloides stercoralis* and Implications for Public Health Action. Tropical Medicine and Infectious Disease, v. 3, n. 2, p. 53, 25 maio 2018.

PATEL, A. et al. A case of Disseminated Strongyloidiasis during treatment for COVID-19. Chest, v. 160, n. 4, p. A278, out. 2021.

PINTOS-PASCUAL, I. et al. Eosinophilia and abdominal pain after severe pneumonia due to COVID 19. Enfermedades infecciosas y microbiologia clinica (English ed.), v. 39, n. 9, p. 478–480, nov. 2021.

PRASAD, K. N.; SAHU, C. Strongyloidiasis. Em: PARIJA, S. C.; CHAUDHURY, A. (Eds.). Textbook of Parasitic Zoonoses. Microbial Zoonoses. Singapore: Springer Nature Singapore, 2022. p. 447–458.

RIVERA, A. D. et al. Hiperinfección por *Strongyloides stercoralis* en un paciente joven con infección por HTLV-1 y colitis ulcerativa. Revista colombiana de Gastroenterología, v. 36, n. 3, p. 408–413, 15 set. 2021.

STREIT, A. Strongyloidiasis: Really a Zoonosis? Em: STRUBE, C.; MEHLHORN, H. (Eds.). Dog Parasites Endangering Human Health. Parasitology Research Monographs. Cham: Springer International Publishing, 2021. v. 13p. 195–226.

STYLEMANS, D. et al. COVID-19–Associated Eosinopenia in a Patient With Chronic Eosinophilia Due to Chronic Strongyloidiasis. Infectious Diseases in Clinical Practice, v. 29, n. 5, p. e305–e306, set. 2021.

The relevance of the development of work in high schools about mental health care, training students and educators to identify and deal with emotions

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ABSTRACT

The objective of this text is to present the results of a field research that is part of the discipline of Interdisciplinary Practical Activities of Extension I, as a requirement to obtain approval at the end of the 2023.2 semester. The research focused on mental health in high school students, focusing on emotions. In the methodology, we conducted a field research, focusing on a qualitative analysis of the data in which we observed the daily life of students from a high school through a field diary and semi-structured interviews. To support our study theoretically and methodologically, we used the contributions of (DORSA, 2020), (SILVA; ALBUQUERQUE, 2021), TEIXEIRA; PACÍFICO; BARROS, 2023), (GUAZI, 2021), (FREITAS; SANTOS; PRADO, 2020), (PESSOA; CRUSOÉ, 2022), (BRITO ET AL, 2021), (PAPALIA; FELDMAN; MARTORELL, 2012), (BOCK, 2008), as well as normative documents of Brazilian education. The study revealed that most students: 1) face difficulties in understanding their emotions; and 2) they face difficulties in administering them in a balanced and healthy manner. In addition, the research allowed us to conclude that there is still a need to strengthen ties between family and school, there is a lack of training and qualification for teachers on the subject and that schools need a more

frequent presence of psychologists in the day-to-day routine of institutions.

Keywords: Mental Health, Emotions, Youth, High School Students.

1 INTRODUCTION

This text is the result of a research that was carried out in the discipline of Interdisciplinary Practical Activities of Extension I[1]. The discipline consisted of a field research of an observational nature, mainly, and of a possible intervention. To obtain the grade of the course, we had to create a research project. The study would have to contemplate the theme "Mental health and youth in the context of High School".

Thus, this text is an unfolding of the research project we produced for the discipline. Our objective with this report is to present the main findings of our field research that was carried out in a public high school.

The general objective of the research project we carried out was to:

- ✓ to investigate the mental health of young high school students in order to identify their main demands and needs related to their emotions. And to achieve this end, we have proposed the following specific objectives:
- ✓ investigate how high school students identify and understand their emotions;
- ✓ present emotions and develop emotional awareness;
- ✓ To emphasize the need to develop work in the school context about the mental health of adolescents.

For this reason, in order to understand the theme and carry out our analysis, we call for contributions from theorists who deal with mental health, youth and how these first two are understood within the current school context.

Our text is, therefore, structured as follows: we present our methodology, based on the studies of theorists: (DORSA, 2020), (SILVA; ALBUQUERQUE, 2021), (TEIXEIRA; PACIFIC; BARROS, 2023), (GUAZI, 2021), (FREITAS; SANTOS; PRADO, 2020), (PESSOA; CRUSOÉ, 2022).

Next, we present the analysis and discussion of the results, but first, we make an introductory theoretical discussion about our theme, bringing the studies of (BRITO ET AL, 2021), (PAPALIA; FELDMAN; MARTORELL, 2012), (BOCK, 2008), among others. Then, we present the reports of the three visits, to show the results found in the interviews.

In the end, we resume our findings in the field research, reinforcing the importance of possible developments of this study and its relevance both for us, psychology students, and for the members who make up the school community in educational institutions.

[1] The discipline was taught by Prof. Master: Denise Alves de Neiva, who is also part of the production of this text.

2 METHODOLOGY

As we have seen, the objective of this study is to investigate the mental health of young people, high school students, in order to identify their main demands and needs related to their emotions and, therefore, an intervention was carried out in the discipline of Interdisciplinary Practical Activities of Extension I, in the axis of Mental Health of the Youth of Ceará. In the first stage of this investigation, a literature review was necessary *a priori*, which, as DORSA (2020) explains, constitutes a line of reasoning that conducts the researchers' investigation and seeks to answer what was produced by other researchers on the researched topic.

After the literature review, the first insertion in the field of adolescent students was carried out, with the objective of knowing the functioning of the school and capturing the needs of these young people. To this end, we conducted a participant observation which, according to Campos, Silva and Albuquerque (2021), is a method used within a qualitative research approach, in which the observer is not just a listener. The researcher joins the observed to record what happens in the environment, allowing them to obtain information through the practice experienced. It is essential that the participant observer is welcomed in the research environment, acquiring the trust of the observed group.

During participant observation, we used field diaries and semi-structured interviews with the coordinator of the Nursing Technician course and with[2] the professors of different disciplines of the school involved in the research. The field diary, as Teixeira, Pacífico and Barros (2023) point out, is a record document, essential in qualitative research, which describes relevant results ascertained from careful observation. Journal entries can also help in defining the research problem.

The observation process was divided into sectors: coordination, teachers' room and classroom. The semi-structured interview is a form of data collection that, according to Guazi (2021), is composed of predetermined open questions, built in advance, and complementary questions that arise from the conversation between the interviewer and the interviewee. The complementary questions aim to collect additional or more detailed information to clarify some relevant data in the interviewee's report.

This study complies with the norms according to Resolution 466/2012 of the National Health Council on research with human beings. Thus, school staff were invited to participate in the research; those who chose to contribute signed the Informed Consent Form (ICF).

In the second stage of the project, there was another insertion in the field so that we, the researchers of this study, could verify whether the data collected correspond to the reality captured in the interviews, in the field observation and in the field diaries. The analysis of data from interviews and field diaries occurred through narrative analysis. Freitas, Santos, and Prado (2020) explain that

[2] The school that participated in the research is a model of vocational schools in the State of Ceará, that is, students who study in this category of school, take their high school and a concomitant technical course. And the Nursing course is one of the technical courses offered at this school institution. The school participating in the research is called: Paul VI State School of Professional Education.

narratives give meaning to certain events in people's lives, and can encourage them to tell their stories, especially when the subject concerns something relevant to them. The authors also talk about the importance of writing during data collection, emphasizing that starting this process in advance facilitates the construction of ideas about what the data points to, how we can analyze them and, especially, the meanings they carry.

As for data collection, it began from the first visit to the school, with the coordination of the Nursing Technician course, based on a semi-structured interview, with pre-selected questions about the students' needs related to their mental health and about the difficulties encountered by educators to welcome, identify, manage and refer students to an adequate follow-up.

In the second moment, a semi-structured interview was conducted with some teachers who teach subjects that are part of the curriculum called "Life Project" and "Citizenship Training", which allow students to talk about their demands related to school difficulties, internships related to vocational training and other demands that may arise.

In the classroom, in order to achieve the objective of investigating the mental health of young high school students, in order to identify their main demands and needs related to their emotions, we used cards that had two simple questions, with which we could identify if and how these young people deal with their emotions and know where to seek help. These cards were answered anonymously and without any identification, all collected in sealed boxes.

The target audience in question was high school students, all enrolled in the public institution, in which we visually analyzed and with precise notes the behavior of young people, seeking to understand the issues and deficiencies to be worked on and improved within the available resources we found[3].

At this stage of the investigation carried out with the students, the interviews and the answers to the boxes were analyzed according to Bardin's Content Analysis method, which, as detailed by Pessoa and Crusoe (2022), divides the analysis into three phases: pre-analysis; exploration of the material and treatment of the results; inference and interpretation. In the pre-analysis, the planning, the organization of the material and the structuring of the first ideas obtained are carried out. It is at this stage that the most frequent subjects for the elaboration of the objectives that will guide the research are found. In the exploration phase of the material, the information contained in the material that

[3] In short, the moment of the visit took place in stages: in the first, we presented ourselves at the school and talked to the school management and the coordination of the technical nursing course, which were the classes that participated in the research (students from the 1st, 2nd and 3rd years, totaling 120 students). In the second stage, our investigation took place with the teachers. And, in the third stage, we conducted an interview with the aforementioned students.

responds to the objectives of the research is analyzed. The third phase works on the results, which are analyzed, detailed, and interpreted in order to carry out a possible intervention[4].

3 THE EXPERIENCE REPORT: DATA ANALYSIS AND DISCUSSION

Before presenting the data of our research, it is appropriate to bring a brief theoretical discussion that helped us to understand the relationship between metal health and high school students, with a focus on emotions[5].

Adolescence (10 to 19 years old) is the phase that prepares young people for adulthood. The mental health of young people depends on physical, ***emotional*** and social factors. Exposure to risky situations, such as abuse and violence, can affect cognition, self-esteem and autonomy of adolescents, and these complications can extend into adulthood.

It is estimated that half of adolescent mental health problems occur around the age of 14 and that 10% to 20% of adolescents worldwide have mental health problems, but few of them are identified, making treatment impossible. In Brazil, it is estimated that one in six adolescents has a mental disorder, increasing the risk of depression, self-mutilation, suicide attempts, and completed suicide (WHO, 2023; UNICEF, 2023; PAPAPOLY; FELDMAN; MARTORELL, 2012).

Depression in adolescents can occur due to the influence of biological changes such as puberty and hormonal changes - a period in which there is ***mood instability and*** intensity of emotions ***-, by*** chronic diseases, body changes or even by external stressors, such as bullying at school and family neglect. It is more common for depression in young people to appear as irritability or difficulty feeling pleasure.

In adolescence, most cases of self-harm occur in girls and women, because this gender is the one that suffers the most from sexual violence, mistreatment, and abandonment, in addition to the discrimination experienced by women worldwide. The most used means of self-harm among women is poisoning; among men, it is body strength (BRITO et al, 2021; PAPAPOLY; FELDMAN; MARTORELL, 2012).

It is necessary to understand that these problems happen, since our young people have not learned to deal with their emotions in a balanced way. Therefore, it is necessary to work more strongly on this theme in the daily life of the school. Of course, the school doesn't have to be alone in this process, nor should it. But, yes, we reiterate: this theme needs to appear more forcefully in the school routine.

[4] Although, in our research, we carried out an intervention, which took place on our fourth visit, we decided, in this report, to present only the first three stages, since our main objective with this text is to disseminate the demands and needs of the students who participated in the research in relation to emotions and how they deal with this theme.

[5] For reasons of space and because it is not our objective here, we will not present the studies that deal with emotion vs. feeling. However, we clarify that the following theorists were read so that we could carry out our research: (REEVE, 2006) and (PISANI et al, 1990).

The difficulty in identifying mental health problems in young people hinders referral to appropriate treatment, and the school environment is a place that can favor this process, avoiding harm in the learning and development of these young people. Therefore, it is essential to create psychoeducational programs that train teachers to identify and refer students with mental health problems for treatment, in addition to reducing the feeling of overload regarding the difficulty of meeting the needs of these young people.

In this sense, working on mental health, focusing on the emotions of young students, is a necessary task. Therefore, it is important that educational institutions are sensitive to this agenda, considering the student in all its spheres.

Considering this, the entire school community, managers and teachers, needs to understand that the function of the school should not be emptied in teaching practices only, since we are dealing with people in the teaching and learning process. For this reason, mental health in youth should be part of the agenda of public policies for education, ensuring financial assistance for training programs, as well as the inclusion of topics on general mental health in the teachers' curriculum (BRITO et al, 2014).

The development of public policies aimed at young people is also essential to ensure the process of renewal of society through opportunities and rights, such as inclusion in the labor market and the development of intervention projects for personal and professional growth. The absence of well-established public policies for youth generates unemployment, inequality and difficulties in the pedagogical sphere (BOCK, 2008).

At this juncture, it is necessary to understand that education is a right of all, therefore it must 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, chap. III, art. 205). However, this goal can only be achieved when care for students' mental health is an inherent agenda of all educational institutions.

Thus, situating youth in the context of the New High School implies understanding the National Common Curriculum Base (BNCC)[6] and its importance in structuring and configuring this new perspective of thinking about teaching and learning and how youth are contemplated in this process.

Ten general competencies are advocated that unify the rights of learning and development of young people, guiding them in the formation of a fair, democratic and inclusive collectivity.

In the pedagogical scope, some important premises are considered, such as the focus on the development of skills, defining essential learning beyond the minimum content taught; the commitment to integral education, breaking with discrimination and prejudice, strengthening respect for diversity;

[6] The BNCC is a normative document that defines the organic and progressive set of essential learning that all students must develop throughout the stages and modalities of Basic Education, so that their learning and development rights are assured (BRASIL, 2018).

and the development of curricula and pedagogical proposals that consider the needs and interests of the student, clearly understanding their differences (BRASIL, 2018).

From this perspective, young people should be considered diverse, dynamic and active in their education process; therefore, their insertion in the world in an autonomous and critical way should be ensured. It is, therefore, up to high schools to contribute to the training of young people so that they are able to make informed decisions and with responsibility, providing experiences that guarantee them learning and respect for their rights. This new structure values, therefore, youth protagonism, as it enables academic deepening and professional technical training; and ratifies the organization of High School by areas of knowledge (BRASIL, 2018).

Therefore, the school will be guided by this perspective and will be preparing the student to know how to deal with different emotions in a balanced and healthy way.

So far, we have presented our methodology and our theme, based on the contributions of scholars. Now, let's dive into the analysis of our data. However, it is pertinent to first contextualize the place where the research is conducted and its target audience.

History of the School	The building where the school now operates was once an animal slaughterhouse, after it became the Paul VI School. Fifty-eight years ago, it was a regular school with a very bad reputation in the neighborhood, as it received repeat students from other schools. Since 2008, the school has become a professional model and has been changing the social perception of the community. Today, the school is sought after by students from all neighborhoods of Fortaleza and the metropolitan region.
Number of students by age group and grade	Currently, the school has 461 students, aged between 14 and 18 years, who are divided into 12 classes, full-time, with 3 classes (with an average of 40 students per class) per course. The courses available at the school are: Nursing Technician, Accommodation Technician, Computer Network Technician and Occupational Safety Technician.
School Sectors	Intended for students, there are 12 classrooms, 4 laboratories for technical courses, 1 computer lab, 1 science lab, 1 library, 1 training itinerary room for the disciplines of the diversified base, 1 sports court, 1 student council room and 1 auditorium, the student bathrooms (male and female) and the school staff bathroom. In addition, there are the teachers' planning rooms, the class director teacher's management room, the coordination room, the principal's room, the secretary's office, the kitchen and the cafeteria.
Dropout and approval rates	According to data from the school's pedagogical coordination, the dropout rate is zero, but there are students who are transferred to other schools for various reasons. The approval rate is 100%, since the philosophy of the vocational school is to spare no effort so that the student succeeds at the end of the three years of training.
How does this index rank when compared to other schools?	Compared to regular schools, vocational education schools live a very different reality, with high performance rates, including students participating in knowledge olympiads, high employability rates, and good rates of insertion in higher education. There are no major problems related to violence or indiscipline.
What activities are currently developed by the students?	Students stay in school full-time, attending 9 classes a day from the subjects of the common national base, the subjects of the technical base, and the subjects of the diversified base. Some students participate in practices of the school's sports teams at the end of class time, another group of students is part of a team of protagonists who help during class breaks. All 3rd year students are in curricular supervised internship in the afternoon. There are students who are part of a German language project at school. In the first semester, students in the 3rd year of the Nursing Course develop a 200-hour social project aimed at the community. During the school year, students also participate in some projects such as Culture Fair, SIPAT, etc.

After contextualizing our field of research, we will present below the report of the visits and our impressions of the information obtained.

3.1 FIRST VISIT: THE MANAGEMENT'S VIEW OF THE THEME OF HEALTH, METAL AND YOUTH

On the first visit, the whole group was introduced to the two coordinators of the Paul VI School, the General Coordination and the Coordination of the Technical Nursing Course. The coordinator of the course brought us several demands aimed at the mental health of both educators and students.

The need for training of educators to identify and manage the needs of students regarding their educational, professional and social anxieties was raised, as well as the need for a more frequent presence of psychology professionals to deal with the high rate of students, who have diverse psychopathologies and great mental suffering, and these are welcomed, in most cases, by health educators, such as nursing technicians, but they are found in smaller numbers.

We also collected information about the class schedule so that we could take action, based on our brief knowledge. We were presented with the class options of the "Life Project", which is part of the discipline of the diversified base, and the "Citizenship Training", which is part of the conversation circle in which educators welcome and try to manage the students' needs about school, internships and the social.

Classes are divided into classes (1st, 2nd and 3rd years), days and times distributed throughout the week. The next steps were defined by the group, in a meeting, where we discussed the intervention to be carried out, the distribution of activities and the scheduling of the next visits.

3.2 SECOND VISIT: THE TEACHERS' VIEW OF THE STUDENTS' NEEDS

Based on the information obtained directly from the teachers, important questions arose. They don't have the right knowledge to deal with the situation involving the mental health of young people. According to teachers, students report that they face physical and verbal assaults, anxiety attacks, and even rape, but teachers are completely unprepared to help students as best they can and prevent further trauma.

Even without in-depth knowledge of the subject or a systematic approach, teachers report that they identify something is wrong through sudden changes in young people's behavior. They often watch for warning signs, such as sudden onset of crying, distress, or rapid breathing. The pandemic has intensified the sudden changes in young people's emotional reactions to distracting screen devices (PC, Mobile) and are associated with a variety of adverse effects on physical and mental health.

Surprisingly, the partnership between the school and the families is almost non-existent in this context. The lack of mutual interest makes it clear that there is no space for effective dialogue. The

school, lacking adequate qualifications, finds itself unable to conduct essential conversations that could address these mental health issues. The request for behavioral reports by families is a rarity, they are requested only in extreme cases, such as for the identification of disorders, such as Attention Deficit Hyperactivity Disorder (ADHD) or Oppositional Defiant Disorder (ODD).

The teachers proposed sensitive topics for discussion, such as drugs, relationships, respect, and nonviolent communication. However, one of the most complex issues is the issue of gender identity, since many reflective students are in the process of becoming aware of their identity.

Also, the question arose as to whether teachers came together to address these unusual incidents with students and find effective solutions. However, the teachers noticed that most of these meetings focused on problem solving and were limited to the exchange of experiences and feelings among themselves.

The unanimous complaint was that the psychologists of the Department of Education (Seduc) did not provide effective support and supervision in schools. Access to mental health professionals appears to be available only in extreme cases, after rigorous screening, which unfortunately leaves many students at the mercy of their emotional and psychological needs.

It can be seen, therefore, that this situation requires an urgent change in the approach and support given to young people in their educational and emotional journey.

3.3 THIRD VISIT: WHAT DO THE STUDENTS HAVE TO SAY ABOUT THIS TOPIC?

We carried out another observation visit. As we have already explained, the first one happened with the purpose of the group and the educational institution getting to know each other, so that, on the occasion, we could present the proposal of the discipline "Interdisciplinary Practical Activities of Extension I" to the school management, in addition to investigating the management's view with regard to the research theme.

Afterwards, the group carried out a visit in which the focus of observation was the teachers, so that we could diagnose possible needs of the school, considering the teacher's point of view. In this third visit, the focus of the observation fell on the figure of the students, since our objective, with another visit, was to identify what the students' needs were, considering the student's own point of view. Below, we report on how our visit was structured and organized.

This third visit took place in two moments: part of the group was in the morning; The other part of the group went in the afternoon.

The group that went in the morning was responsible for talking to the school management about how the visit would take place. The initial idea was to divide ourselves by class, so that we could observe at least one hour/class.

However, the school's coordination made some considerations, which restructured the visit: before, our idea was to make a box with questions related to emotions; We would enter the classrooms, introduce ourselves, talk about the methodology of the little box, and then remain in the room, just observing phenomena and happenings and writing down pertinent points that were observed in class.

However, the coordinator's speech reoriented our intention and we had to change the format of our observation visit: it was then agreed that, after the students' break, we would enter the classrooms, make our presentation and explain the purpose of our visit, emphasizing the importance of their participation in the methodology of the question box. From the students' answers, we would have a panoramic view of their needs and the extent to which we could intervene.

By way of clarification, we explain below how we restructured our visit in order to correspond to the guidelines of the school coordination.

At the school, there are three classes of the Nursing course in the following years: 1st, 2nd and 3rd of High School (with 45 students, 42 students and 40 students, respectively). As there were four members of the group, we made the following division: for each room, we directed one member, and the fourth member tried to accompany the three students a little to be able to record the photos.

In order to standardize how our approach would be in the classroom, before addressing the classes that would receive our visit, we agreed that our speech would be structured in four moments:

1) greetings of welcome;
2) presentation of the group;
3) our goal with the visit to the school;
4) the methodology of the question box and the importance of the class's participation in the activity.

At the time, it was explained that the box would remain in the room all day, so that, as the students answered the questions, they would put their answers in the box, because, in the afternoon, the other members of the group would come to the school to pick up the box with the students' answers. We also explained that if their answers didn't fit on the paper we handed out, students could feel free to write on a larger paper. At the end of the approach, we gave a thank you to the classes, excused ourselves and met again in the coordination room.

In the afternoon, the school received a visit from the other members of the group who went to collect the boxes.

After these two moments, the group mobilized to appropriate the answers left in the box by the students. It is interesting to return here to the two questions asked to the students, which were:

QUESTION 1:
"How do you usually relate to your emotions and understand them?"
QUESTION 2:
"Do you have knowledge of how and where to find emotional support when you need it? Let us know."

The objective with these questions was to be able to identify the needs of the students of this school and the possible intervention actions, while considering how far we could intervene and how we could help in these demands.

After having access to the students' answers, we have listed numerous and diverse responses that, for reasons of space, we will present, in the report, the ones that were most repeated.

For question 1, it is relevant to highlight that the vast majority of students answered: 1) that they do not know how to deal with their emotions, having difficulty managing them; 2) others feel confused when dealing with their emotions or with certain emotions; 3) they don't know how to deal with them, sometimes depending on the moment, the situation, the emotion; 4) or who don't fully understand their emotions.

By analyzing the students' responses, we can identify that they face difficulties both in understanding their emotions and in managing them.

When it comes to question 2, there is also a variety of answers that we consider important to record, for example: although some answered that they go to therapy, or ask for help at CAPS or call 188, most students revealed that they keep the problems they face to themselves; others, in a mystical-religious bias, revealed that they usually vent to God, which does not fail to characterize a certain type of introspection.

The answers to the second question make us reflect on the need to learn how to deal with our emotions and feelings and to talk about the importance of seeking help whenever necessary.

Having carried out this moment of observation/listening to the different members of the school community (management, teacher and students) was important, because it confirmed our hypothesis that it is necessary to develop and strengthen work in schools that address the care of the mental health of young people and that, therefore, it is never too much to focus on this theme in the school context, since it has become more and more present as an urgent agenda that can never be ignored.

4 FINAL THOUGHTS

We saw that the main objective of this report was to disseminate the results of a field research, whose theme was emotions in the school context of high school students.

From the visits, we were able to contact that there is still much to be done in schools so that students feel supported and, thus, learn to deal with their emotions adequately, balanced and healthily, since most students face difficulties both to understand their emotions and to manage them.

The survey also revealed that the other members of the school feel the need for more education and training on mental health, in order to be able to deal with the subject, in addition to a more marked presence of psychologists to work in this context and a strengthening of the bonds between family and school.

For this reason, we believe that emotional awareness can teach teens and young adults that they are able to learn to identify and name their emotions, which is key to better communicating what they are feeling and seeking support when needed.

A possible outcome of this study is its resumption, with the objective of a more in-depth analysis of the responses, demands and difficulties that were perceived during the visits, to develop new studies based on these findings.

Finally, we also hope that, with this experience, this being our first insertion in the field of the psychologist profession, we can develop more technical skills with the young public.

REFERENCES

BOCK, A. M. B.; FURTADO, O.; TEIXEIRA, M. de L. T. Psicologias: uma introdução ao estudo de psicologia. 14ª ed. São Paulo: Saraiva, 2008.

BRASIL. Ministério da Educação. Base Nacional Comum Curricular. Brasília: MEC, 2018. Disponível em <http://basenacionalcomum.mec.gov.br/images/BNCC_EI_EF_110518_versaofinal_site.pdf>. Acesso em 29 ago. 2023.

BRASIL. Constituição (1988). Constituição da República Federativa do Brasil. Brasília, DF: Presidência da República, 1988. Disponível em <https://www.planalto.gov.br/ccivil_03/constituicao/constituicao.html.>. Acesso em 29 ago. 2023.

BRITO, F. A. M. de et al. Violência autoprovocada em adolescentes no Brasil, segundo os meios utilizados. Cogitare Enfermagem, v. 26, p. e76261, 2021.

CAMPOS, J. L. de A.; SILVA, T. C.; ALBUQUERQUE, U. P. de. Observação Participante e Diário de Campo: quando utilizare como analisar? In: Métodos de Pesquisa Qualitativa para Etnobiologia. 1ª Ed. p. 95-112. NUPEEA, 2021.

DORSA, A. C. O papel da revisão da literatura na escrita de artigos científicos. Interações (Campo Grande), v. 21, n. 4, p. 681–683, jul. 2020.

FREITAS, C. A. M.; SANTOS, A. M. dos.; PRADO, N. M. de B. L. Gibbs G. Análise de dados qualitativos. Saúde em Debate, v. 44, n. 125, p. 580–582, 2020.

GARCIA, Fátima. Fortaleza em Fotos. Disponível em <http://www.fortalezaemfotos.com.br/2012/12/bairro-jardim-america.html?m=1>. Acesso em 13 set 2023.

GUAZI, T. S. Diretrizes para o uso de entrevistas semiestruturadas em investigações científicas. Revista Educação, Pesquisa e Inclusão, v. 2, p. 1-20, 2021.

Organização Pan-Americana da Saúde (OPAS). Saúde Mental dos Adolescentes. Disponível em <https://www.paho.org/pt/topicos/saude-mental-dos-adolescentes>. Acesso em 30 ago. 2023.

PAPALIA, D. E.; FELDMAN, R. D.; MARTORELL, G. Desenvolvimento humano. 12ª ed. Porto Alegre: AMGH, 2013.

PEIXOTO, Marcos. Diário do Nordeste. Jardim América viveu a febre do americanismo. Disponível em <https://diariodonordeste.verdesmares.com.br/metro/jardim-america-viveu-a-febre-do-americanismo-1.642121>. Acesso em 13 set 2023.

PESSOA, Z. S. S.; CRUSOÉ, N. M. DE C. A técnica de análise de conteúdo na pesquisa qualitativa: práticas de formação continuada para as coordenadoras pedagógicas do município de Cordeiros-Bahia. Momento - Diálogos em Educação, [S. l.], v. 31, n. 03, p. 161–178, 2022.

SECRETARIA MUNICIPAL DE SAÚDE DE FORTALEZA. Sistema de Monitoramento Diário de Agravos. População consolidada por bairro segundo a faixa etária, fortaleza, 2021-2022. Disponível em <https://simda.sms.fortaleza.ce.gov.br/simda/populacao/faixa>. Acesso em 13 set 2023.

TEIXEIRA, É. J. P.; PACÍFICO, J. M.; BARROS, J. A. O diário de campo como instrumento na pesquisa científica: contribuições e orientações. Cuadernos de Educación y Desarrollo, [S. l.], v. 15, n. 2, p. 1678–1705, 2023.

UNICEF. É preciso agir para promover a saúde mental de adolescentes. Disponível em <https://www.unicef.org/brazil/saude-mental-de-adolescentes>. Acesso em 30 ago. 2023.

VIEIRA, M. A. et al. Evaluating the effectiveness of a training program that builds teachers' capability to identify and appropriately refer middle and high school students with mental health problems in Brazil: an exploratory study. BMC Public Health, n. 14, v. 210, 2014.

Plastics in the environment and trends for the future

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ABSTRACT
The studies carried out are about the first molecules, classification, properties and environmental problems caused by the rampant disposal of plastics. In this context, with the increase in the unbridled consumption of plastic, which has been contributing to major contamination in all environments, mostly culminating in the oceans. It should be noted that polypropylene is one of the most used polymers in the manufacture of flexible plastic packaging and the accumulation of these materials in the environment, especially in the oceans, has been causing several negative impacts on the planet's biodiversity. An alternative to the problems caused by the improper disposal of this waste would be the replacement of traditional plastics with biodegradable and compostable polymers from renewable sources whose life cycle tends to be less polluting, since, under favorable conditions, they degrade in biologically active environments, not producing toxic waste for the environment. Therefore, it becomes necessary to implement legislations that favor the use of bioplastics over conventional plastics and the changes in consumer behavior that drive the market for biopolymers. The problems of plastics in the environment and in human health are presented as a function of the understanding of the concerns, in addition to a look at priorities, challenges, opportunities that bring benefits with the application of plastics in the future. However, about the use and disposal that have been increasing, and the need to recycle and reverse this trend, so that they can be considered end-of-life materials, as valuable raw materials for new production, instead of waste.

Keywords: Synthetic polymers, Coronavirus, Environmental pollution, Bioplastics.

1 INTRODUCTION

Plastics are produced from petroleum derivatives, composed mainly of hydrocarbons, and the most commonly used are: polyvinyl chloride (PVC), polypropylene (PP), polyethylene (PE), polystyrene, nylon, and polyethylene terephthalate (PET) (URBANEK et al., 2018; MATJAŠIČ et al., 2021; BAHL et al., 2021). Polyethylene (PE) and polypropylene (PP) are the most widely used, accounting for a share of 54% (BAHL et al., 2021).

Polyethylene is widely used in agricultural environments, with the main purpose of maintaining temperature, soil moisture, and restricting weed growth (DING et al., 2019). However, after use they

are broken into pieces that reduce soil quality, impairing the transport of water and nutrients, leading to crop malnutrition and reduced yield (HOU et al., 2019). Generally, the removal of polyethylene pollution is carried out through collection and incineration, which is expensive and highly toxic with the emission of harmful and poisonous gases into the air (BRIASSOULIS et al., 2015).

Thus, the management of post-consumer plastics, such as incineration and landfills, promote catastrophic damage to ecosystems, such as the release of toxic compounds into the soil and/or atmosphere, since many are greenhouse gases or carcinogenic substances.

These contaminants are emitted because of the incineration process (PERUGINI et al., 2005; TEUTEN et al., 2009; DHAKA et al., 2022). Some of these toxic compounds emitted and released are benzene, toluene, xylene, styrene, polycyclic aromatic hydrocarbons, chlorine compounds, heavy metals, carbon monoxide and dioxide, free radicals, aldehydes, acids, ketones, lactones, saturated hydrocarbons, cyclic ethers, cyclic esters, alkenes, and dienes (ARACIL et al., 2004; SIDDIQUI & REDHWI, 2009; DHAKA et al., 2022).

Another damage caused by improper disposal of plastics causes blockage of the gastrointestinal tract and strangulation in fish, birds, and mammals (SPEAR et al., 1995; DHAKA et al., 2022).

Biodegradation is defined as the environmentally friendly method, where microorganisms that have high enzymatic potential can cleave polymers into smaller monomers, which are used as a carbon source and later mineralized (ALSHEHREI et al., 2017). According to MONTAZER et al, (2020) the biodegradation of complete polyethylene has not yet been described. In this sense, research on plastics, especially polyethylene, considering the problems caused to the environment, and human health. However, plastics had important applications during the pandemic in the preparation of PPE, which is essential for protection by reducing the spread of SARS-CoV-2, in the control of the pandemic, and in the pursuit of environmental sustainability.

2 HISTORICAL EVOLUTION OF POLYMER DEVELOPMENT

The word polymer (from the Greek poly, many, mere, parts) was created by Berzelius, in 1832, to designate compounds of multiple molecular weights, with the contribution of Chemistry to industrial development, with these polymeric materials. Polymers are macromolecules that are characterized by their chemical structure, size, and intra- and intermolecular interactions, which have chemical units linked by covalence, repeated along the chain. (BRO; MENDES, 1999).

Cotton, proteins, rubber, starch, and wood (natural materials) were the first polymers that were used, where their use was mainly made from the extraction of resins from trees used in the manufacture of thickeners, paper, glues, cosmetics, jewelry and a diversity of materials (SPERLING, 2006). In the mid-nineteenth century, modified polymers began to be produced from natural macromolecules, presenting more versatility for commercial applications. The Parkesine resin, considered the first

plastic material, was synthesized in 1860, produced from the modification of cellulose nitrate, by the English creator Alexander Parkes, but without commercial viability due to the high cost of manufacture and being flammable. From Parkes' discovery, the American typographer John Wesley Hyatt began to carry out his experiments with parkesin and developed celluloid. And from cellulose nitrate with the addition of alcohol, sawdust, camphor, pyroxylin and paper pulp created a natural ivory substitute. Celluloid became the first viable artificial plastic, widely used in dental prostheses, as it is a solid and stable version of nitrocellulose. (LOPES, 2007).

In the twentieth century, with the advancement in polymer science, Leo Baekeland carried out the first large-scale industrial production of bakelite resin. Later, several polymers were developed including polyvinyl chloride (PVC), polystyrene (PS), polyamide (Nylon), polyacetyl chloride (PVA), polyethylene terephthalate (PET), polymethyl methacrylate (PMMA), polyvinylidene chloride (PVDC), high and low density polyethylene (HDPE and LDPE), and molding techniques were also developed, enabling the use of these plastics in a very diverse way. (LOPES, 2007).

In 1920, with the theory of the macromolecule, proposed by Staundinger, some materials known as colloids, formed by several molecules, could originate compounds with 10,000 or more carbon molecules, being the great reference in the history of polymeric materials. Thus, several studies have led to the discovery and development of various polymers, as shown in Table 1 (CANEVAROLO 2002; ROSE; PANTANO FILHO, 2003; PADILHA, 2007).

Table 1- Historical evolution of polymers

Polymers	**1st Occurrence**	**First. Industrial Production**
PS	1900	1936/37
PVC	1915	1933
LDPE (LDPE)	1933	1939
NYLON	1930	1940
HDPE (HDPE)	1953	1955
PC	1953	1958
PP	1954	1959

Source: CANEVAROLO (2002).

3 VARIETIES OF SYNTHETIC PLASTICS AND APPLICATIONS

The different types of plastics are intended to serve the market, demonstrating applicability in many sectors. In this context, the wide variety of most used plastics are listed in Table 2,

Table 2- General Applications of Synthetic Polymers

POLYMERS	APPLICATIONS
Polyethylene	Plastic Tote Bag, Water Bottle, Food Packaging, Toy, Irrigation & Drain Pipe, Motor Oil Bottle.
Polystyrene	Disposable Cups, Laboratory Supplies and Electronic Products.
Polyurethane	Tires, Sealing, Bumpers, Refrigerator Insulation, Sponges, Mattresses and Life Jacket.
Vinyl Chloride	Car Seat Covers, Shower Curtains, Rain Covers, Shoe Soles, Greenhouses, Cables and Electricity Pipes.
Polypropylene	Bottle Caps, Beverage Straws, Medicine Packaging, Car Seats, Car Batteries and Disposable Syringes.
Polyethleno Terephthalate	Soft drink bottles and textile fiber.
Nylon	Windshield wipers, Helmets, Paints and fabrics.
Polycarbonate	Car Headlights, Baby Bottles, Kitchen Utensils, Greenhouse Roofs, Solar Heaters.
Polytetrafluoroethylene (Teflon)	Spectacle lenses and pans.

Source: Vona et al., (1995).

According to the polymer market, the growth of the most consumed industrial products worldwide is related to their properties and economic value, being suitable materials for the application of packaging and durable goods (GONÇALVES, 2009). Thus, the sectors that most demand polymers are as follows: Packaging (30%); Automotive (20%); Electronics (15%); Civil construction (15%); Textiles (15%) and Others (5%) (ROSA; PANTANO FILHO, 2003).

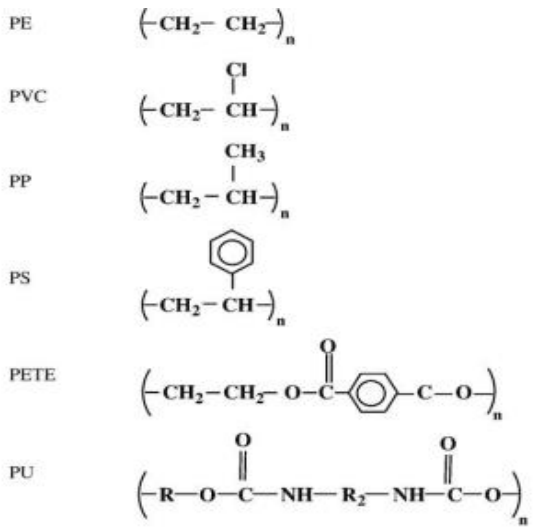
All polymers are macromolecules, but not all macromolecules are considered polymers. Almost all these materials have a molecular weight between 104 and 106, however, it is possible to find some natural polymers with a very high molecular weight of 108 or more. The degree of polymerization is established by the number of groupers in the polymer chain, usually known as n or DP ("degree of polymerization") (MANO; MENDES, 1999; DE PAOLI, 2009). The molecular weight of the polymer is made up of the molecular weight of the monomeric unit Mu and the product of the degree of polymerization n (NOGUEIRA; SILVA; SILVA, 2000).

3.1 CHARACTERIZATION OF SYNTHETIC POLYMERS

Cross-linked polymers have cross-links where a union occurs between two main chains. These bonds can be weighted in such a way that a polymer lightly or highly, or with low or high cross-link density, respectively, is obtained (LUCAS; SOARES. MONTEIRO, 2001).

Regarding their chemical structure, they can be classified as homogeneous, when the chain is composed only of carbon atoms, and as heterogeneous, when it is composed of atoms that are different from carbon, as shown in Figure 1 (MANO; MENDES, 1999).

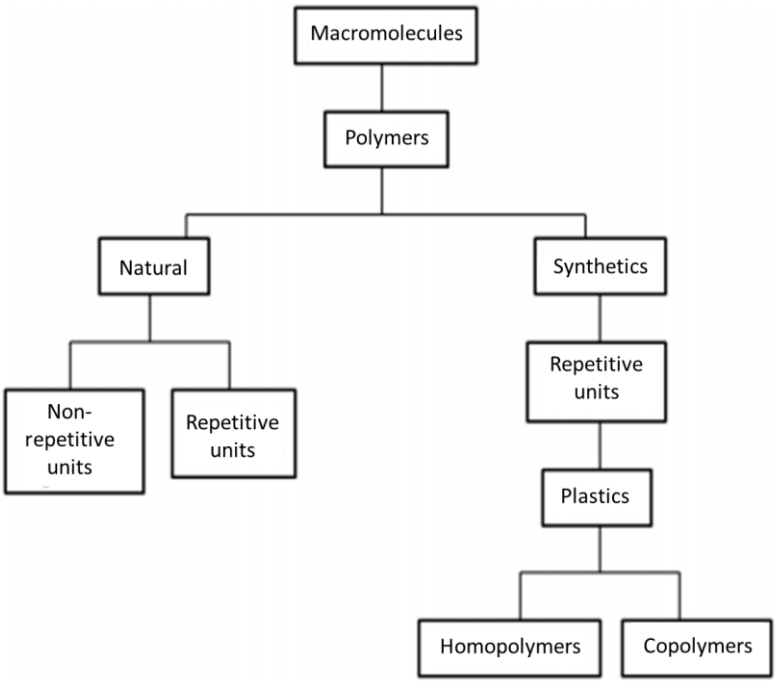
Figure 1. Structures of plastics of conventional petrochemical origin: Polyethylene (PE), Polyvinyl chloride (PVC), Polypropylene (PP), Polystyrene (PS), Polyethylene terephthalate (PET), Polyurethane (PU). [Source: (D.L. Paiva et al., 1988]



To understand the synthesis and degradation of plastics, it is important to understand the morphology, structure, and physical, chemical and mechanical properties of polymers, and to understand the difficulties and motivations, as shown in Figure 2.

Polymeric materials can be classified into different forms, such as molecular structure, mechanical behavior, chain nature, morphology, type of reaction, type of monomers, and spatial arrangement of monomers. Based on molecular strengths, polymers are classified as elastomers, fibers, thermoplastics, and polymers (ALVES, 2005;).

Figure 2 – Flowchart of some polymer classifications.



Source: LUCAS; SOARES; MONTEIRO (2001); OLATUNJI, (2016); OLATUNJI, 2016;)

Cross-linked polymers have cross-links where a union occurs between two main chains. These bonds can be weighted in such a way that a polymer lightly or highly, or with low or high cross-link density, respectively, is obtained (LUCAS; SOARES. MONTEIRO, 2001).

4 SYNTHESIS AND CATEGORIES OF SYNTHETIC POLYMERS

Regarding the shape behavior when polymers are subjected to high temperatures, they can still be classified into thermoplastics and thermosets. Thermoplastics, linear and branched polymers, are those that soften when heated, being considered a very important characteristic, because in this way it is possible to mold the plastic, so that it can be reused several times (ANDRADE, 1995 apud ALVEZ, 2005). Thermosets, which originate from cross-linked polymers, are those that, when heated once, soften and undergo the process called curing (irreversible chemical transformation), becoming rigid. After this procedure occurs, the plastic becomes insoluble infusible, no longer softening, consequently, in this way, it cannot be reused in molding for new materials, presented in Tables 4 and 5. (CANEVAROLO, 2002; ALVES, 2005).

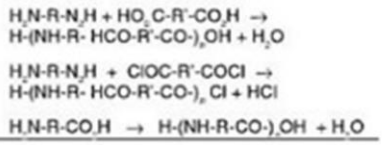
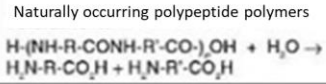
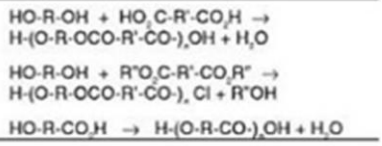
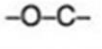
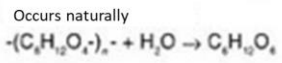
According to morphology, polymers can still be classified as amorphous and semi-crystalline. Those in which molecules are randomly oriented are called amorphous; and the semicrystalline ones are formed by amorphous and crystalline regions, where in the molecular chains they are perfectly aligned. Strong intermolecular interactions make the material resistant and harder than amorphous ones (ALVES, 2005).

Thermosets, which originate from cross-linked polymers, are those that, when heated once, soften, and undergo the process called curing (irreversible chemical transformation), becoming rigid. After this procedure occurs, the plastic becomes insoluble infusible, no longer softening, consequently, in this way, it cannot be reused in molding for new materials, presented in Tables 4 and 5. (ALVES, 2005).

Table 4 – Classification of polymers according to their form fixed by the bonds

Molecule architecture	Polymer designation	Definition
	Linear	Formed by the bonds of monomers in a continuous length
	Type A branches	Comb-type architecture, with long branches.
	Type B branches	Comb-type architecture, with short branches.
	Type C branches	Dendritic structure, in which the branches also have branches
	Reticulated	Structures in which polymer chains are linked together forming a network or lattice.

Table 5 – Condensation-Formed Polymers

Type of polymer	Characteristic link	Structure of the resulting polymer
Polyamide		
Protein, wool, silk		Naturally occurring polypeptide polymers 
Polyester		
Cellulose		Occurs naturally 

Source: Lucas; Soares; Monteiro, (2001).

4.1 CHARACTERISTICS AND PROPERTIES OF THERMOPLASTICS

Thermoplastics have the following characteristics: high molecular weight polymers; chains in the polymer are associated with intermolecular forces; the intermolecular force acting between the chains becomes weak with increasing temperature and produces a liquid with high viscosity; And these polymers can be remodeled. These polymers are different from thermosetting polymers because thermosetting polymers do not fuse when heated.

Thermoplastics are recyclable. These are lightweight, high-strength polymers and act as flame retardants (xx).

Additionally, polypropylene has a low tolerance to ultraviolet rays, additives such as prevented amines stabilize light and extend shelf life compared to unmodified polypropylene. Clarifiers, flame retardants, glass fibers, minerals, conductive fillers, lubricants, pigments, and a variety of other polymeric additives can improve the physical and/or mechanical properties of polypropylene.

4.1.1 Polypropylene Copolymer (PP Flake)

Polypropylene copolymer (PP Cup) is a transparent material, more flexible and resistant (except chemical resistance) than homopolymer. When modified with elastomers, it becomes more resistant to impact. In addition, it has high mechanical resistance at low temperatures.

4.1.2 Copolymer polypropylene can be either heterophasic or random.

Random copolymer polypropylene is produced by the random addition of a comonomer (usually ethylene) in the polymerization reaction. In this way, ethylene partially replaces propylene in the polymer chain.

The presence of the co-monomer decreases the tendency to crystallization, which results in an increase in impact strength, greater resistance to bending, and increased transparency of the polymer. Due to the low crystallinity, random copolymer polypropylene also has lower density and lower melting temperature.

Heterophasic (or block) copolymer polypropylene is a type of polymer where there is an elastomeric phase dispersed in the matrix, arising to meet the demand for polymeric materials with good impact resistance, including at low temperatures, a property not found in homopolymer polypropylene. However, because it is a polymeric material, it has a high coefficient of thermal expansion when exposed to temperature variations, in addition to having a high thermal contraction after its injection.

5 FORMS OF IDENTIFICATION OF PLASTICS

These codes indicate the type of polymer that is in the products. When the numbering is located, the waste is separated and segregated according to its nature. Code "7 – Other Plastics" is used for less common plastics, such as polyamide, polycarbonate, or other miscellaneous combinations of other polymers. The standard in this case suggests that the use of the polymer acronym should be below the symbol.

Much of the plastics that have already been consumed are sent to landfills or are incinerated, only 7% is recycled. This process has great complexity, and can be divided into four categories of recycling: primary, secondary, tertiary and quaternary. Primary recycling, also known as closed-loop, corresponds to a mechanical processing and has as a product a material with similar characteristics,

the secondary, or declassification recycling, produces materials where the properties differ from each other, but is still considered a mechanical recycling. The tertiary, raw material recovery or chemical recycling, aims at the recovery of the chemical elements, that is, the raw material, through the depolymerization of the original plastic. And finally, quaternary, or energy recovery, aims to recover the energy that the compounds of the initial steps possessed (Figure 9) (WILLIAMS & WILLIAMS, 1999; FISHER, 2003; SONG et al., 2009; HOPEWELL et al., 2009

The NBR 13.230 standard of ABNT brings the symbology of identification of plastic products and raw materials, according to Figure 3.

Figure 3. ABNT NBR 13.230 standard with the symbology of identification of plastic products and raw materials. [Image source: ABNT NBR 13230 Standard - Recyclable plastic packaging and packaging - Identification and symbology].



6 PROPERTIES OF THE MAIN TYPES OF PLASTICS

6.1 POLYETHYLENE TEREPHTHALATE – PET

Rigid and transparent material undergoes slow crystallization, is amorphous, absorbs a lot of moisture (as it is an ester) melts under temperatures close to 265ºC. It has excellent impact resistance, low permeability to gases (CO2). Some applications of PET are: filaments (weaving threads), magnetic tapes, X-ray films, printing laminates, food cooking packaging, carbonated beverage bottles, food bottles, cosmetics, and cleaning products.

6.2 HIGH DENSITY POLYETHYLENE – HDPE (HDPE)

Opaque material due to its higher density and high degree of crystallinity. It has higher mechanical properties than LDPE and LLDPE. It is resistant to low temperatures, light, waterproof, rigid, with excellent chemical and mechanical resistance. Very chemically resistant, which allows its application in the packaging of cleaning products and chemical products. Also used in the manufacture of auto parts.

6.3 POLYVINYL CHLORIDE – PVC

This plastic material has great importance due to its great versatility, that is, with the addition of additives such as plasticizers, lubricants, stabilizers, pigments and dyes, fillers among other additives, it is possible to obtain a multitude of "grades" with very different properties for different applications. PVC is used in food, cosmetics, and medicine packaging; in hoses in general; in civil construction in pipes and fittings, in conduits, in covering wires and cables, in lining, in floor covering, in frames and windows; as "synthetic leather" for the footwear, handbags and upholstery industry; medical-hospital accessories, among other various applications.

6.4 LOW-DENSITY POLYETHYLENE AND LINEAR LOW-DENSITY POLYETHYLENE – LDPE AND LLDPE (LDPE AND LLDPE)

Material with low electrical and thermal conductivities. It is resistant to chemical attack. It is non-toxic. Flexible, light and transparent (when at low thicknesses). Widely used in packaging for food and personal care products, pipes for irrigation, wire insulation, etc. LLDPE is mainly used in the production of flexible food packaging.

6.5 POLYPROPYLENE HOMOPOLYMER – PP HOMO

High temperature resistant material that can be sterilized. Good chemical resistance and few organic solvents can solubilize it at room temperature. Compared to HDPE, it has lower density, higher softening point, higher surface hardness, higher rigidity, lower impact resistance, higher sensitivity to oxidation, better resistance to cracking stress and higher brittleness at low temperatures. Material widely used in the manufacture of hinged parts, auto parts, food packaging, fibers and monofilaments, among others.

7 IMPACTS CAUSED BY PLASTICS TO THE ENVIRONMENT

7.1 APPLICATION OF PLASTIC IN REDUCING SARS-COV-2 CONTAMINATION

The novel Coronavirus (SARS-CoV-2) has wreaked havoc around the world, affecting almost every country. Several countries are currently battling the second or third wave of the virus, which is wreaking far worse havoc than the first. A variety of plastic-based personal protective equipment (PPE) has been instrumental in protecting people during the COVID-19 pandemic. Every day, a significant amount of single-use PPE, including masks, gloves, protective aprons, face shields, safety glasses, containers with disinfectants, plastic shoes, and aprons (made mostly of polypropylene) are discarded by healthcare workers and the general public. Although, this personal protective equipment reduces the spread of SARS-CoV2, the lack of sustainable management poses a serious threat to public health and the environment. Because the SARS-CoV-2 virus can survive in discarded medical waste for up

to 168 hours, medical waste coming from hospitals, clinics, medical centers, home isolation, and quarantine facilities where the infected individual is receiving treatment is likely to spread and increase the infectivity of the virus. Therefore, the environmental consequences for human health of single-use personal protective equipment aimed at the proper use of plastic in PPE to reduce the spread of SARS-CoV-2 (PRATA et al., 2020; ZAKIA et al., 2023; MORAES, G.H.; COLTRO, 2023).

7.2 DISPOSAL AND HANDLING OF POST-CONSUMER PLASTICS

It is estimated that the amount of plastic waste that will be generated in the year 2060 will increase to 265 million metric tons (LEBRETON and ANDRADY 2019). In addition to causing visual pollution, plastic waste causes changes in biogeochemical cycles and environmental matrices (SANZ-LÁZARO et al. 2021; WANG et al. 2021).

Most of this waste is consumed in high- or upper-middle-income countries. This problem arose a few years ago, and it has already been found that more than 75% of all plastic that has been produced has become waste (SILPA KAZA et al, 2018).

Of all solid waste collected in urban cleaning, 13.5% is plastic. Of this total, most are disposable packaging, such as bottles, bags, jars, jars, and films (VILHENA et al, 2018). According to the National Association of Waste Pickers (ANCAT), PET, LDPE and HDPE represent almost 70% of the types of plastics that are found in urban waste in 2018, as they are the main constituents of packaging (ANCAT - National Association of Waste Pickers).

Plastic waste is classified according to its size into megaplastics (> 1 m), macroplastics (2.5 cm–1 m), mesoplastics (5 mm–2.5 cm), microplastics (1 – 5,000 μm), and nanoplastics (< 1 μm) (Lippiatt et al. 2013). Their residues are pollutants that are persistent to degradation, remaining for long periods and potentially affecting the biota (VAN BIJSTERVELDT et al. 2021; AZEVEDO-SANTOS et al. 2021). Given its ubiquity, a diverse set of organisms interact with plastic waste in their daily lives (e.g., nesting material), can entangle, and/or ingest plastic (JAGIELLO et al. 2019; KÜHN and VAN FRANEKER 2020; AYALA et al., 2021; AYALA et al. 2022a,b).

The accelerated consumption of plastics generates a large amount of waste, which the world is not prepared to deal with. In 2022, Brazil generated 64 kilograms of plastic waste per person. Plastic waste is the most common pollutant found in the planet's water bodies, accounting for 48.5% of the materials that leak into the seas. The most recent data show that about 22 million tons of plastics leak into the environment each year worldwide, and a considerable part of it is destined for the oceans (MORAES and COLTRO, 2023).

The scarcity of space for the creation of new landfills and the high costs have influenced the changes with this plastic waste. The problem of the impacts generated becomes even more serious when disposed of incorrectly. However, techniques such as recycling and incineration began to be used

more frequently, emphasizing that some types of plastics, when incinerated, generate toxic greenhouse gases, such as PVC, which produce hydrochloric acid, which is corrosive and toxic (GEYER, JAMBECK, and LAW, 2017).

8 FINAL THOUGHTS

In principle, all recycling processes are possible, but there are several implications that make it difficult to carry out these processes. Most thermoplastics are composed of a variety of polymers and other materials, such as paper, metals, adhesives, pigments, paints and antioxidants, complicating the primary recycling process, which is the most used process in this category of materials, especially in plastic packaging. In order to be able to carry out mechanical recycling, it is necessary to separate the polymer from the material of non-plastic artifacts and sources of contamination, which can be stable in the degradation process and/or during processing. Thus, sources of contamination include chemical or pharmaceutical residues deposited in plastic packaging, as well as residues from contact with industrial, domestic or hospital waste.

Chemical recycling benefits the recovery of the petrochemical constituents of the polymer and discards most of the mishaps that are directed towards mechanical recycling. However, this recycling has a high cost in relation to the low cost of the raw material, being economically unfeasible, and this procedure is of high cost, being necessary to polymerize the molecule so that it can be polymerized again, The incineration of energy materials is also associated with energy recycling, without the appropriate technology, which can result in emissions of toxic gases harmful to health and the environment.

Therefore, with the environmental problems caused by plastic waste as the main focus of environmental pollution issues, it is essential to create initiatives based on the "New Plastic Economy", directed towards a vision in the circular economy, for plastic that never becomes waste. Therefore, innovative strategies must be used to eliminate problematic or unnecessary plastic packaging through redesign, innovation, and new delivery models becomes a priority.

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REFERENCES

ALSHEHREI, Fatimah. Biodegradation of synthetic and natural plastic by microorganisms. Journal of Applied & Environmental Microbiology, v. 5, n. 1, p. 8-19, 2017.

ALVES, C. J. Desenvolvimento de metodologia de ensaios para avaliação comparativa do envelhecimento de borrachas nitrílicas expostas à diversas condições de temperatura e ambiente. 2005. 93 f. Dissertação (Mestrado em Engenharia Mecânica) – Escola Politécnica, Universidade de São Paulo, São Paulo

ARACIL, I.; FONT R, CONESA, J A. Semivolatile and volatile compounds from the pyrolysis and combustion of polyvinyl chloride. Journal Analytical and Applied Pyrolysis, v. 74, p.465–478, 2005.

AZEVEDO-SANTOS, V.M.; MARQUES, L.M.; TEIXEIRA, C.R. et al. Digital media reveal negative impacts of ghost nets on Brazilian marine biodiversity. Mar. Pollut. Bull. v.172,p.112821, 2021, 2031. https://doi.org/10.1016/j.marpolbul.2021.112821

AYALA F.; LAJO-SALAZAR L.; CÁRDENAS-ALAYZA S. White-naped squirrels use plastic waste for nest construction in agricultural areas of northern Peru. Int J. Environ. Stud., v.79, p.724–730, 2022b.

AYALA, F.; CASTILLO-MORALES, K.; CÁRDENAS-ALAYZA, S. Impact of marine debris recorded in a sympatric colony of otariids in the south coast of Peru. Mar. Pollut. Bull. v.174, p.113281, 2022a https://doi.org/10.1016/j.marpolbul.2021.113281

AYALA, F.; VIZCARRA, J.K.; CASTILLO-MORALES, K. et al. From social networks to bird enthusiasts: reporting interactions between plastic waste and birds in Peru. Environ Conserv., 2023. https://doi.org/10.1017/S037689292300005X

BAHL, Shashi et al. Biodegradation of plastics: a state-of-the-art review. Materials Today: Proceedings, v. 39, p. 31-34, 2021.

BRIASSOULIS, Demetres et al. Analysis of long-term degradation behaviour of polyethylene mulching films with pro-oxidants under real cultivation and soil burial conditions. Environmental Science and Pollution Research, v. 22, n. 4, p. 2584-2598, 2015.

CANEVAROLO, S. V. Ciência dos Polímeros: um texto básico para tecnólogos e engenheiros. São Paulo: Artliber Editora, 2002. 183 p.

DE PAOLI, M. A. Degradação e Estabilização de Polímeros. 1 ed. São Paulo: Artliber, 2009. v. 1, 286 p.

DHAKA, V. et al. Occurrence, toxicity and remediation of polyethylene terephthalate plastics. A review. Environmental Chemistry Letters, v.13, p.1-23, 2022.

DING, Ling et al. The occurrence and distribution characteristics of microplastics in the agricultural soils of Shaanxi Province, in north-western China. Science of the Total Environment, v. 720, p. 137525, 2020.

GEYER, R. ;JENNA R.; JAMBECK, R.and LAW, K.L. Production, use, and fate of all plastics ever made. Science Advances, v. 3, n7, p. ,2017.

GONÇALVES, S. P. C. Biodegradação de filmes de PHBV, PCL, PP e blendas pela ação de micro-organismos de solo. 2009. 157 f. Tese (Doutorado em Microbiologia Aplicada) – Instituto de Biociências, Campus Rio Claro, Universidade Estadual Paulista. Rio Claro.

HOU, L. et al. Biodegradability and ecological impacts of polyethylene-based mulching film at agricultural environment. Journal of hazardous materials, v. 378, p. 120774, 2019.

JAGIELLO, Z.; DYLEWSKI, Ł.; TOBOLKA, M.; AGUIRRE, J.I.. Life in a polluted world: a global review of anthropogenic materials in bird nests. Environ Pollut v.251p.717–722, 2019. https://doi.org/10.1016/j.envpol.2019.05.028

KÜHN, S.; VAN FRANEKER, J.A. Quantitative overview of marine debris ingested by marine megafauna. Mar. Pollut. Bull. 151:110858, 2020. https://doi.org/10.1016/j.marpolbul.2019.110858

LEBRETON, L.; ANDRADY, A. Future scenarios of global plastic waste generation and disposal. Palgrave Commun 5:1–11, 2019. https://doi.org/10.1057/s41599-018-0212-7

LUCAS, E. F.; SOARES, B. G.; MONTEIRO, E. Caracterização de Polímeros. Brasil: Epapers, 1 ed., 2001. 366 p.

MONTAZER, Z.; NAJAFI, H.; M.B. and Levin, D.B. Challenges with verifying microbial degradation of polyethylene.Polymer, v.12, n.123, p.1-24, 2020.

MATJAŠIČ, Tjaša et al. Critical evaluation of biodegradation studies on synthetic plastics through a systematic literature review. Science of The Total Environment, v. 752, p. 141959, 2021.

MORAES, G.H.; COLTRO , L. Embalagens para alimentos e o novo coronavírus: desafios e oportunidades para a indústria de embalagens pós-Covid-19. Food Technol. v.26 , 2023. https://doi.org/10.1590/1981-6723.00322

PRATA, J.C., SILVA, A.L., WALKER, T.R., DUARTE, A.C., Rocha-Santos, T. COVID-19 pandemic repercussions on the use and management of plastics. Environmental Science & Technology, v. 54, p. 7760–7765, 2020. https://doi.org/10.1021/acs.est.0c02178

MÜLLER, R. J. Biodegradability of Polymers: Regulations and Methods for Testing. In: Steinbüchel A, editor. Biopolymers, v. 10. Weinheim: Wiley-VCH, 2003. 516 p.

NOGUEIRA, J. S.; SILVA, A. L. B. B.; SILVA, E. O. Introdução a Polímeros. In: Semana de Química, 2, EFT-MT, 2000, Mato Grosso. Anais II Semana de Química. Mato Grosso, 2000, 27 p.

OLATUNJI, O.O.
Biomedical Application of Natural Polymers.
Natural Polymers pp.93-114, 2016.

OLATUNJI, O.O. and Olsson, R.T.
Chapter . Processing and Characterization of Natural Polymers
Natural Polymers pp.19-61, 2016.

SANZ-LÁZARO, C.; CASADO-COY, N.; BELTRÁN-Sanahuja, A. Biodegradable plastics can alter carbon and nitrogen cycles to a greater extent than conventional plastics in marine sediment. Sci Total Environ 756:143978, 2021. https://doi.org/10.1016/j.scitotenv.2020.143978

VAN BIJSTERVELDT, C.E.J.; VAN WESENBEECK, B.K.; RAMADHANI, S. et al Does plastic waste kill mangroves? A field experiment to assess the impact of macro plastics on mangrove growth, stress response and survival. Sci Total Environ 756:143826, 2021. https://doi.org/10.1016/j.scitotenv.2020.143826

ZAKIA, M.A.; AKTER, S.; RONY, Z.I.; RAHAMAN, M.; AHMED, S.F.; VO, D-V.N.; Environmental and human health impact of single-use plastic-made personal protective equipment used to limit the spread of SARS-CoV-2 . Conference Proceedings 2785, 030012, 2023. https://doi.org/10.1063/5.0149930

WANG, J.; PENG C.; LI, H. et al. The impact of microplastic-microbe interactions on animal health and biogeochemical cycles: a mini-review. Sci Total Environ 773:145697, 2021. https://doi.org/10.1016/j.scitotenv.2021.145697

SEVEN publicações acadêmicas

Congenital lymphedema a literature review

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ABSTRACT

Congenital lymphedema is a rare and chronic medical condition characterized by abnormal development or function of the lymphatic system, resulting in localized edema and enlargement of tissues, usually in the extremities. This condition is present from birth or becomes evident during childhood. It can be classified into primary and secondary types, with primary congenital lymphedema being linked to genetic mutations affecting the lymphatic vessels and secondary congenital lymphedema due to other congenital conditions or developmental problems. The diagnosis of congenital lymphedema is typically based on clinical examination and may be supported by imaging studies such as lymphoscintigraphy. Management and treatment aim to relieve symptoms and improve patients' quality of life. Therapeutic approaches often include manual lymphatic drainage, compression therapy, and skin care practices to reduce swelling and prevent complications such as cellulite. Genetic counseling may be relevant for cases of primary congenital lymphedema, while treatment of secondary congenital lymphedema may address the underlying causes. In summary, congenital lymphedema is a genetic condition that requires early diagnosis, multidisciplinary treatment, and a thorough approach to lessen its impact on affected individuals. Understanding its genetic and secondary causes is essential for providing appropriate care and support to people living with this condition.

Keywords: Lymphedema, Genetic, Oedema, Ends, Multidisciplinary.

1 INTRODUCTION

Lymphedema is defined as the abnormal accumulation of interstitial fluid and fibrofatty tissue resulting from injury, infection, or congenital anomalies of the lymphatic system. This system is a circulatory network of vessels, ducts, and nodules that filters and distributes certain protein-rich fluids (lymph) and blood cells throughout the body. In congenital lymphedema, lymphatic fluid accumulates in the subcutaneous tissues under the outermost layer of the skin (epidermis) due to obstruction, malformation, or underdevelopment (hypoplasia) of several lymphatic vessels. As a result, swelling (lymphedema) and thickening occurs, as well as hardening of the skin in the affected areas, most commonly in the legs and feet (BRANDÃO et al., 2020).

The formation of interstitial fluid results from the movement of intravascular fluid through the capillary membranes due to arteriolar blood pressure. Much of the interstitial fluid returns to the intravascular fluid via the postcapillary venules. The dynamics of fluid production are influenced by arterial and venous hydrostatic pressures, tissue pressure, intravascular and interstitial fluid oncotic pressure, and membrane permeability. Normally, the dynamics favor an interstitial gain, and the excess is removed by the lymphatic channels. Because lymphatic vessels often lack a basement membrane, they can also reabsorb molecules that are too large for venous uptake. In summary, the lymphatic system controls the pressure, volume, and composition of interstitial fluid (BETHESDA, 2023).

Lymphatic obstruction leads to accumulation of interstitial fluid, which often contains large proteins and cellular debris. By mechanisms not fully understood, the increase in interstitial fluid induces inflammation, destruction or sclerosis of lymphatic vessels, fibrosis, and, ultimately, hypertrophy of adipose tissue (BETHESDA, 2023).

Lymphedema is etiologically classified into two groups: primary lymphedema and secondary lymphedema. The secondary occurs due to injury, obstructions, or other damage to the lymphatic system. Although filariasis caused by Wuchereria bancrofti infection is the most common cause of lymphedema worldwide, in developed countries, most cases of secondary lymphedema are related to malignancies or their treatment. This includes lymph node removal surgery, radiation therapy, or medical therapies (SLEIGH; MANNA, 2022).

Primary lymphedema can be divided into three types: congenital lymphedema, which is present at birth or detected up to two years later; early lymphedema, which appears during puberty or at the beginning of the third decade of life; or late lymphedema, which appears after the age of 35 years (SLEIGH; MANNA, 2022).

Regarding congenital lymphedema, Milroy's disease is its main presentation, it is the mutation in locus q35.3 of chromosomes 5, and the gene related to this area, known as FLT-4, responsible to produce VEGFR-3 is its characteristic pathophysiology. (KORHONEN et al., 2022).

The diagnosis of lymphatic system alterations can be made using lymphoscintigraphy. This is a procedure that uses a small amount of radioactive dye protein injected into the space between the first and second digits of the affected limb. The limb is photographed with a gamma camera to observe the dye as it moves through the lymphatic system. Images showing dye outside the lymphatic structures suggest edema of lymphatic origin (BROWNELL, 2022).

Despite advances in the understanding of the disease and in the standardization of the physical therapy approach, the treatment of lymphedema remains a challenge and requires a multidisciplinary approach. In addition, the treatment is expensive and requires a lot of time and effort from both the patient and the medical team in charge. The main goal of therapy is to reduce swelling and restore the function and appearance of the affected limb. However, one of the biggest obstacles is the lack of comparative protocols between the different forms of treatment, as many reports in the medical literature are based on uncontrolled and non-randomized case series (BROWNELL, 2022).

2 LYMPHANGIOGENESIS

The lymphatic system appears in the 6th or 7th week of embryonic development, about four weeks after the appearance of the first components of blood circulation. There is no definition for the formation of the lymphatic system. However, there are several theories for this formation and among all of them there are two that are more accepted: the first is Sabin's that says that early in fetal development, primitive lymphatic sacs would be originated by the sprouting of endothelial cells from the veins of the embryo. The other accepted theory is Huntington & McClure. This suggests that primitive lymphatic vessels arose in the mesenchyme from lymphangioblasts independent of the veins, growing centripetal and establishing connections with them later (PETRONA et al., 2020).

Although there are recent reports supporting Sabin's centrifugal theory, studies in birds have observed the existence of primitive lymphangioblasts in the mesenchyme. It is possible that both theories are combined, with lymphatic vessels originating from the venous endothelium and anastomosing with other lymphatics originating from mesenchymal tissue cells (KORHONEN et al., 2022).

The development of the lymphatic and blood systems is controlled by a complex network of cell signalers and receptors. Among these signals, the most important are a family of glycoproteins called vascular endothelial growth factor (VEGF). VEGF is responsible for endothelial cell regulation, angiogenesis, vasculogenesis, and vascular permeability. This family of proteins is divided into five types: VEGF A, B, C, D, and E, which bind to membrane-specific tyrosine kinase receptors, known as vascular endothelial growth factor receptor 1 (VEGFR-1/Flt1), 2 (VEGFR-2/Flk1/KDR), and 3 (VEGFR-3/Flt4). Activation of the VEGFR-2 receptor by VEGF is considered the primary pathway for endothelial cell angiogenesis and mitogenesis (KORHONEN et al., 2022).

Mutations in the genes that control vascular endothelial growth factor (VEGF) or its receptors (VEGFR-1/Flt1, VEGFR-2/Flk1/KDR or VEGFR-3/Flt4) can lead to a failure in the development of blood vessels, leading to embryonic death. When there is an overexpression of these signals and receptors, an abnormal expression of the lymphatic system occurs, while their decrease results in the reduction of the lymphatic system. Such results are observed in experiments (PETRONA et al., 2020).

Neuropilins 1 and 2, abbreviated as NRP-1/2, are receptors that have a strong affinity for vascular endothelial growth factor (VEGF) and are found in the cell membranes of both the vascular and nervous systems. In addition, NRP-2 can also bind to VEGF-C, resulting in activation of the VEGFR-3 receptor in lymphatic endothelial cells (ANDRADE, M., et al 2008).

Other important regulators of vascular remodeling are angiopoietins, which include Angiopoietins 1 to 4. They play a crucial role in the process and act through the receptor tyrosine kinase known as Tie-2. Although the function of the Tie-1 receptor is still unknown, it is important to highlight that Angiopoietins 1 and 4 act by activating the Tie-2 receptor, while Angiopoietins 2 and 3 exert an inhibitory effect, blocking the action of Angiopoietin 1. This complex balance of interactions plays a key role in the regulation of angiogenesis and vascular remodeling (ANDRADE, M., et al 2008).

2.1 CONGENITAL LYMPHEDEMA

Lymphedema is defined as the abnormal accumulation of interstitial fluid and fibroadipose tissue resulting from injury, infection, or congenital abnormalities of the lymphatic system. Lymphedema is classified as primary or secondary depending on etiology and presentation (SZUBA; ROCKSON., 2018)

In primary lymphedema, the cause is a congenital change in the development of the lymphatic vessels and lymph nodes or an unknown preservation of the lymphatic vessels, also known as idiopathic lymphedema. In secondary lymphedema, on the other hand, there is an anatomical dysfunction of normal lymphatic tissue that has been affected by surgery or radiotherapy, the most common example being post-surgical or post-radiotherapy lymphedema (BROUILLARD et al., 2017).

Primary lymphedema is categorized based on the age at which the swelling manifests and is divided into congenital, early, and late. Early lymphedema is the most common form, accounting for the majority of cases, about 77% to 94%. Although it can appear between the ages of 2 and 36, it is more frequent during early puberty, usually manifesting as unilateral swelling, especially in the foot and calf. Women are more often affected, with a prevalence 10 times higher compared to men. The underlying cause is unknown in most cases, although there is speculation about the possible role of estrogen, given that the condition is more common in girls during puberty (VALENTINI; MATTOO; HOPPIN, 2022).

Although most cases are sporadic, 10% of cases of early lymphedema are hereditary, known as Meige's disease, with an autosomal dominant inheritance pattern. This type of early lymphedema is associated with distichiasis, which is the growth of double rows of eyelashes, and is called lymphedema-dysticiasis syndrome. A mutation in the FOXC2 gene, located at 16q24.3, has been identified in families with this syndrome. Mutation in FOXC2 leads to the absence of lymphatic valves and increased migration of muscle cells to lymphatic capillaries. In addition, FOXC2 is highly expressed in venous valves, which may explain why about half of patients with lymphedema-dysticiasis also have venous insufficiency (VALENTINI., et al 2023).

On the other hand, congenital lymphedema, which presents before the age of two, occurs due to congenital and/or hereditary abnormalities associated with inadequate development of lymphatic vessels. This may include a reduction in the number of lymphatic collectors, a decrease in the diameter of the lymphatic vessels (lymphatic hypoplasia), an increase in the diameter of the lymphatic collectors (lymphatic hyperplasia), the absence of lymphatic system components (lymphatic aplasia), and fibrosis in the lymph nodes. Finally, late-onset lymphedema manifests after the age of 35 years, most often in women, and affects the lower extremities (VALENTINI., et al 2023).

2.2 PATHOPHYSIOLOGY OF LYMPHEDEMA

The lymphatic system has a large functional reserve, that is, it is capable of transporting a much larger amount of lymph than the physiological need of the body. Under normal conditions, the lymphatic output, which is the amount of lymph transported per unit of time, is equal to the lymphatic load, which corresponds to the amount of fluids and lymphatic transport substances present in the tissues. However, when there is an increase in the lymphatic load, the lymphatic output also increases, until the maximum transport limit is reached. From this point on, edema arises (ASHINOFF et al., 2021).

When there is a loss of normal function of the lymphatic vessels, even with lymphatic loads within normal physiological values, there is an accumulation of fluids and macromolecules in the tissues. This type of edema is known as true lymphedema, which is characterized by having a high protein content. The amount of fluid associated with edema, at least in its initial phase, is due to the osmotic power of this system. Classically, the chronic presence of proteins in the extravascular space can cause a painful and fibrous process, giving rise to some characteristics of the disease. Recently, it was discovered that hyaluronic acid, an essential component of the extracellular matrix, also accumulates in the tissues of patients with lymphedema (BRICE, G; MANSOUR, S; BELL, R., et al., 2018)

In addition, the development of swelling requires changes in the way the capillaries work, so as to favor an increase in the amount of fluid that is filtered and, at the same time, an inefficient removal

of this excess fluid through the lymphatic drainage system. Swelling can arise as a result of an increase in hydraulic pressure in the capillaries, which creates a "hydraulic pressure difference," or due to an increase in capillary permeability (Lp). It can also be caused by the breakdown of the endothelial glycocalyx layer, reduced flexibility of the interstitial space, decreased plasma osmotic pressure (which decreases the "osmotic pressure difference"), or a combination of these factors. In addition, swelling can be caused by obstruction of the lymphatic system, preventing the filtered fluid from returning to the systemic circulation as it normally would (STERNS., et al 2023)

2.2.1 Pathophysiology of congenital lymphedema

Milroy's disease is a dominantly inherited condition characterized by a lymphatic hypoplasia or aplasia. Genomic studies have identified a mutation in the q35.3 locus of chromosomes 5, and the gene related to this area, known as FLT-4, is responsible for the production of VEGFR-3 (KORHONEN et al., 2022).

An experimental model of hereditary type I lymphedema in rats was developed through mutagenesis, which resulted in the inactivation of the VEGFR-3 gene. The mutant rats showed hypoplasia of the lymphatic vessels of the skin and lymphedema in the paws, but no alteration in the lymphatic tissue of the internal organs (HO; GORDON; MORTIMER, 2018).

Patients with primary lymphedema were found to have increased levels of VEGF-D in their blood. This can be explained by the absence of stimulation in VEGFR-3, which leads to a higher production of VEGFR-D as an attempt to compensate for the deficiency in lymphatic vessel formation caused by the lack of VEGFR-3 (Hwang, J. H; Cha, J. H.; Han, Y. D; & Kang, H. 2019).

Meige described hereditary lymphedema type II, an early-onset condition with a family history, which is transmitted in an autosomal dominant manner. However, the clinical manifestation can vary greatly, with low penetration and variable phenotype. The most frequent symptom is bilateral and symmetrical edema below the knees, which is more common in women (3:1). Some experts suggest that Meige's disease can be seen as a subcategory of lymphedema patients, without the presence of other common features of the syndrome, such as distichiasis, ptosis, cleft palate, yellow nails, and congenital heart disease (KORHONE et al., 2022).

3 EPIDEMIOLOGY

Primary lymphedema is rare, affecting 1 in every 100,000 individuals. Secondary lymphedema is the most common cause of the disease and affects approximately 1 in every 1,000 Americans (SLEIGH; MANNA, 2022).

Milroy's disease shows an autosomal dominant inheritance pattern with penetrance of 80-90%. A first type of Milroy's disease was mapped to the telomeric part of chromosome 5q (5q34-q35) in

several families, while a second locus was mapped to chromosome 6q (6q16.2-q22.1) in a single inbred Pakistani. Ferrell et al. were the first to identify a mutation in Milroy's disease in the FLT4 gene (also known as VEGFR3) located at 5q34-q35. Subsequently, more mutations of the FTL4 gene were identified in a study of patients with this pathology. In this, they found a mutation in the FTL4 gene in 75% of typical Milroy patients with a positive family history and 68% of sporadic patients (BORNAR, 2018)

Mutations in patients who have a phenotype that is not typical of this disease (lymphedema of the lower limbs, unilateral or bilateral, but symptoms not seen at birth and the presence of other features not previously associated with Milroy's disease) is very small (<5%). Most FLT4 mutations are autosomal dominant, but a single homozygous hypomorphic mutation was found in an autosomal recessive form of nonsyndromic primary congenital lymphedema (MEHRARA et al., 2022).

4 CLINICAL MANIFESTATIONS

The most common finding in the disease is bilateral congenital lymphedema of the lower limbs. Edema is usually present from (or before) birth. Rarely, prenatal pleural effusion and hydrops fetalis have been reported. In neonates, swelling tends to mainly affect the dorsum of the feet (foot edema). Anecdotal evidence suggests that, on rare occasions, it develops later in life (JIANG et al., 2018).

The amount of edema varies within and between families. The swelling is usually bilateral, but may be asymmetrical (Figures 1 and 2). The degree of edema sometimes progresses, but in some cases it can improve, especially in the first few years. Other features are associated with Milroy's disease: Hydrocele (37% of men); Prominent veins (23%) below the knees (with or without venous reflux seen on Doppler imaging); Inclined toenails (spoon-shaped and/or dysplastic) (14%); Papillomatosis located in the toes and/or forefoot (10%); Urethral abnormalities, such as hypospadias or urethral stricture, in men (4%) (JIANG et al., 2018).

Cellulitis occurs in approximately 20% of affected individuals, with infection significantly more likely in men than in women. Cellulitis can damage existing lymphatic vessels, resulting in an increase in the degree of swelling (VALENTE et al., 2021)

Figure 1. Characteristic lymphedema in the child's foot: initial evaluation.



Fonte: Artíbale., et al (2005, p 02)

Figure 2. Bilateral primary lymphedema of the lower extremities along with toenails



Cast iron: KITSIOU-TZELI., et al (2010, p 3)

5 DIAGNOSIS

A history and physical examination with typical clinical features consistent with lymphedema and asymmetric limb measurements can usually establish a diagnosis of lymphedema. For newborn patients, the suspicion of congenital lymphedema arises from delivery or in the first days of life, because many patients with the disease already have changes in the symmetry of the limbs at the time of delivery or days after. (MEHRARA et al., 2022).

Different imaging methods have been used to diagnose lymphedema, such as lymphoscintigraphy, computed tomography (CT), magnetic resonance imaging (MRI)/MR

lymphography, and indocyanine green lymphangiography (ICG). Unfortunately, the lack of standardization in the techniques used results in variable outcomes, especially for lymphoscintigraphy. However, in centers specializing in lymphatic disorders, different techniques can be used in a standardized way to portray specific lymphatic dysfunction (MEHRARA et al., 2022).

Lymphoscintigraphy shows the flow of macromolecules and interstitial fluid from the skin to the lymph nodes, particularly at the extremities. Subcutaneous or intradermal radioactive tracers are injected into the extremities, and imaging is obtained 30 to 120 minutes after injection. The patient then performs a stressful activity (such as walking, massaging or squeezing a ball for approximately 20 minutes), which is followed by repetition of the image. Criteria for lymphatic function impaired by qualitative lymphoscintigraphy include delayed, asymmetrical, or absent visualization of regional lymph nodes and dermal reflux. Quantification of the marker's regional lymph node accumulation appears to be more sensitive than qualitative lymphoscintigraphy (RANZENBERGER, 2023).

ICG lymphangiography is a technique in which an infrared dye is injected intradermal (Figure 3). The dye is bound to albumin after injection and therefore absorption is restricted to the lymphatic vessels. The lymphatic vasculature can then be visualized directly with specialized sensors. Anatomy of the lymphatic vessels, leakage, pumping capacity, and dermal reflux can be seen. This is currently an off-label use of ICG; however, many lymphatic surgeons rely on ICG imaging for preoperative analysis and staging of lymphedema (BRORSON, H., & SVENSSON, H. 2007).

Clinics and hospitals use imaging techniques, such as CT scans and MRIs, to detect fluid overload in the soft tissues of the extremities of patients with lymphedema. Studies report that CT has good sensitivity and specificity, with a sensitivity of 93% and specificity of 100% in patients detected by CT and lymphoscintigraphy. The main CT findings in patients with lymphedema include thickening of the skin (95%), accumulation of subcutaneous edema (95%), and "honeycomb" appearance (41%). On the other hand, MRI has advantages in demonstrating lymphatic channels, but the injected contrast material can be captured by nearby veins, requiring discernment to distinguish from lymphatic vessels, which generally have a contoured appearance and higher signal intensity (MEHRARA et al., 2022).

For patients diagnosed with primary lymphedema or suspected late lymphedema, referral to a medical geneticist or genetic counseling service is suggested for evaluation of family history and recommendations for further testing (ZANTEN et al., 2021).

Molecular genetic testing approaches may include a combination of gene-targeted testing (single-gene test, multigene panel) and comprehensive genomic testing, depending on phenotype (ZANTEN et al., 2021)

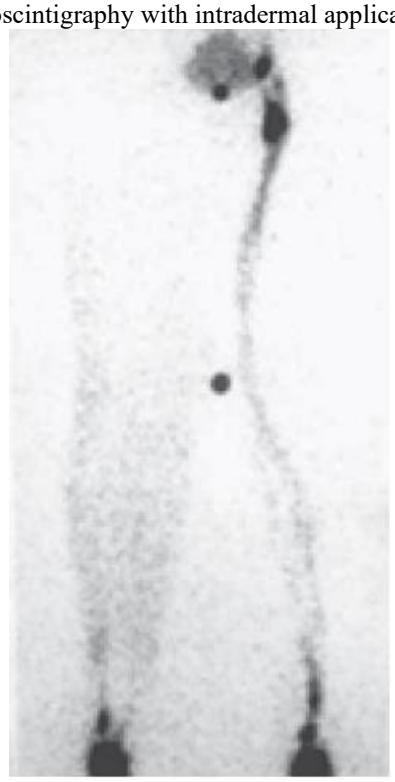
Gene-directed testing requires the clinician to determine which gene(s) are likely to be involved, while genomic testing is not. Because Milroy's phenotype is broad, individuals with the distinct findings are likely to be diagnosed using gene-directed tests, while those with a phenotype

indistinguishable from many other inherited disorders with lymphedema are more likely to be diagnosed using genomic testing (ZANTEN et al., 2021).

The single-gene test consists of the analysis of the FLT4 sequence. This test is capable of detecting small intragenic deletions/insertions and junction site variants. In Milroy's disease, most variants are pathogenic nonsense in the tyrosine kinase domain of the gene (SHIMTH et al., 2023).

A multigene lymphedema panel that includes FLT4 and other genes of interest is more likely to identify the genetic cause of the condition at the most reasonable cost, limiting the identification of variants of uncertain significance and pathogenic variants in genes that do not explain the underlying phenotype (SMITH et al., 2023).

Figure 3. Lymphangioscintigraphy with intradermal application of 99 technology.



Source: DOMINGUES., et al (2011, p4)

5.1 DIFFERENTIAL DIAGNOSIS

The differential diagnosis of lymphedema is comprehensive and based on the specific distribution of the edema (MEHRARA et al., 2022).

Chronic venous insufficiency: Lymphedema shares many clinical features with chronic venous insufficiency (CVI). Lymphedema is distinguished from CVI by the absence of typical varicose veins, absence of distribution of characteristic skin changes (i.e., severe discoloration in the medial region of the ankle in CVI), and relief of symptoms and reduction of swelling with elevation of the limb. Doppler ultrasonography will demonstrate typical findings of venous valve insufficiency. However, a subset of patients with severe and long-standing chronic venous insufficiency may develop concomitant

lymphedema; Acute deep vein thrombosis – Classic symptoms of a deep vein thrombosis (DVT) include acute edema, pain, and erythema involving a limb (MEHRARA et al., 2022).

The onset of oedema and associated symptoms (e.g., acute erythema, calf pain) easily distinguish DVT from lymphedema; Postthrombotic syndrome – Postthrombotic syndrome (PTS) is the development of chronic venous symptoms and/or signs secondary to DVT. These include pain, venous dilation, oedema, pigmentation, skin changes and venous ulcers. A previous history of DVT can distinguish this condition from lymphedema; Limb hypertrophy – Several syndromes are characterized by limb size discrepancies that may be due to hypertrophy of the soft tissues and bones (i.e., Klippel-Trenaunay syndrome) or disproportionate overgrowth of body parts (i.e., Proteus syndrome), which may affect one or more limbs (IANNIELLO et al., 2015).

These syndromes are associated with other clinical manifestations, such as capillary malformations, which may help differentiate them from lymphedema; Lipedema is a rare adipose disorder characterized as abnormal fat deposition with associated edema. A pedigree analysis suggests that it is inherited as an X-linked or autosomal dominant condition. It occurs almost exclusively in women. Patients with lipedema may have family members who also have abnormal patterns of fat deposition but usually have no history of lymph node resection or trauma as seen in lymphedema. Patients with lipedema may complain of pain, tenderness, and bruising easily (Rabe et al., 2018).

Elevation of the limbs has no effect on lipedema. The feet are usually not involved, but they may or may not be involved in lymphedema. Physical examination will help differentiate lipedema from lymphedema; Patients with lipedema usually do not have pitting edema, whereas lymphedema may present with pitting edema. If doubt persists, imaging studies may help. Patients with lipedema usually have normal lymphatic function, whereas patients with lymphedema may experience dermal reflux and lack of lymph node uptake; Myxedema results from infiltration of the skin by glycosaminoglycans with associated water retention, leading to non-pitting edema. In particular, recurrence of breast cancer in the axillary area or the development of lymphangiosarcoma should be excluded (MEHRARA et al., 2022).

6 TREATMENT

Congenital lymphedema is a condition in which there is an abnormal accumulation of lymphatic fluid in the tissues, causing prolonged edema, usually in the extremities of the body. Treatment for congenital lymphedema is directed toward symptom management and may involve a multidisciplinary approach that includes medical care, physical therapy, and supportive care. Some of the treatments that may be considered include compression therapy with the use of compression garments, such as compression socks, sleeves, or gloves (Figure 4). These can help reduce swelling

and improve lymphatic flow. Manual lymphatic drainage is a specialized massage technique that can help stimulate lymphatic flow and reduce fluid swelling. Exercise and movement, such as walking, swimming, or yoga, can help stimulate lymphatic flow and improve circulation. Skin care with this is important with this is to keep the skin clean and hydrated to prevent and other complications (KAUFMAN et al., 2016).

It may be necessary to use special creams or lotions to care for the skin healed by lymphedema. Additionally, physical therapy can be helpful in managing congenital lymphedema, with techniques such as strengthening exercises, joint alignment, and balance training helping to improve function and quality of life. Weight management is important to reduce the burden on the lymphatic system and improve the symptoms of lymphedema. Finally, surgical treatments may be considered in severe cases of congenital lymphedema, such as removal of excess affected tissue or lymphatic bypass surgery to divert lymphatic flow to healthy areas (Kaufman et al., 2016).

The indications for surgical treatment of lower limb lymphedema are: Lack of improvement or progression despite conservative measures; Non-operational management that has reached a plateau; Recurrent cellulite; Limitation of function (e.g., mobility, contracture); Lymph leakage into body cavities, organs, or externally; Deformity or disfigurement; Pain and decreased quality of life, including emotional or psychosocial distress (SCHAVERIEN; MUNNOCH; BRORSON, 2018).

Figure 4. Child wearing compression stocking



Fonte: Artíbale., et al (2005, p 02)

REFERENCES

ASHINOFF, Russell L. et al. Lower extremity lymphedema. UpToDate, 2021. Disponível em: https://www.uptodate.com/contents/lower-extremity-lymphedema. Acesso em: 11 de abr. de 2023.

ANDRADE, M.. Linfangiogênese e genética dos linfedemas: revisão da literatura. Jornal Vascular Brasileiro, v. 7, n. 3, p. 256–261, set. 2008.

ARTÍBALE, M. E. S. et al.. Uma nova opção para contenção no tratamento do linfedema em crianças. Jornal Vascular Brasileiro, v. 4, n. 3, p. 311–313, set. 2005.

BELLINI, Carlo et al. Lymphatic dysplasias in newborns and children: the role of lymphoscintigraphy. The Journal of pediatrics, v. 152, n. 4, p. 587-589. e3, 2008. Disponível em: https://www.sciencedirect.com/science/article/pii/S002234760701164X).

BETHESDA. Lymphedema (PDQ)-Health Professional Version. National Cancer Institute, 2023. Disponível em: https://www.ncbi.nlm.nih.gov/books/NBK65803/. Acesso em: 12 de abr. de 2023.

BORMAN, Pınar. Lymphedema diagnosis, treatment, and follow-up from the view point of physical medicine and rehabilitation specialists. Turkish journal of physical medicine and rehabilitation, v. 64, n. 3, p. 179, 2018.

BRANDÃO, Marcelo Luiz et al. Eficácia da terapia complexa descongestiva para linfedema nos membros inferiores: revisão sistemática. Jornal Vascular Brasileiro, v. 19, 2020.

BROUILLARD, Pascal et al. Loss of ADAMTS3 activity causes Hennekam lymphangiectasia–lymphedema syndrome 3. Human Molecular Genetics, v. 26, n. 21, p. 4095-4104, 2017.

BROWNELL N., et al . Protein-losing gastroenteropathyUpToDate, 2022. Disponível em: https://www.uptodate.com/contents/protein-losing-gastroenteropathy?search=linfangectasia&source=search_result&selectedTitle=1~31&usage_type=default&display_rank=1. Acesso em: 11 de out. de 2023.

DOMINGUEZ, Luis., et al Linfedema congênito, enfermedad de milroy. Acta Médica Grupo Ángeles, v. 4 n.3, set. 2011

HO, Bernard; GORDON, Kristiana; MORTIMER, Peter S. A genetic approach to the classification of primary lymphoedema and lymphatic malformations. European Journal of Vascular and Endovascular Surgery, v. 56, n. 4, p. 465-466, 2018.

IANNIELLO, Andrea et al. ISVI-IUA consensus document diagnostic guidelines of vascular anomalies: vascular malformations and hemangiomas. Int Angiol, v. 34, p. 1-2, 2015.

JIANG, Xinguo et al. Hypoxia and Hypoxia-Inducible Factors in Lymphedema. Frontiers in Pharmacology, v. 13, 2022.

KAUFMAN, J. A et al. Techniques in vascular and interventional radiology: Lymphatic Interventions. Techniques in Vascular and Interventional Radiology, v. 19, n. 4, 2016.

KITSOU-TZELI, Sophia et al. Milroy's Primary Congenital Lymphedema in a Male Infant and Review of the Literature. Acessado em 11 de set. 2023

KORHONEN, Emilia A. et al. Lymphangiogenesis requires Ang2/Tie/PI3K signaling for VEGFR3 cell-surface expression. The Journal of Clinical Investigation, v. 132, n. 15, 2022.

MACIEL, Gustavo Sasso Benso et al. Linfangiectasia intestinal em adulto: relato de caso. Jornal Vascular Brasileiro, v. 20, 2021. Disponível em: <https://doi.org/10.1590/1677-54m49.200160>. Epub 11 Jun 2021. Acesso em 11 de abr. de 2023.

MEHRARA, Babak et al. Clinical staging and conservative management of peripheral lymphedema. UpToDate, 2022. Disponível em: https://www.uptodate.com/contents/clinical-staging-and-conservative-management-of-peripheral-lymphedema?search=linfedema%20congenito&source=search_result&selectedTitle=3~11&usage_type=default&display_rank=3. Acesso em: 10 de abr. de 2023.

OLIVEIRA, Mariana Maia Freire de et al. Long term effects of manual lymphatic drainage and active exercises on physical morbidities, lymphoscintigraphy parameters and lymphedema formation in patients operated due to breast cancer: A clinical trial. PloS one, v. 13, n. 1, 2018.

RABE, Eberhard et al. Indications for medical compression stockings in venous and lymphatic disorders: An evidence-based consensus statement. Phlebology, v. 33, n. 3, p. 163-184, 2018.

SCHAVERIEN, Mark V.; MUNNOCH, D. Alex; BRORSON, Håkan. Liposuction treatment of lymphedema. In: Seminars in plastic surgery. Thieme Medical Publishers, p. 042-047, 2018.

SLEIGH, Bryan C.; MANNA, Biagio. Lymphedema. StatPearls [Internet]. Treasure Island (FL), 2022. Disponível em: https://www.ncbi.nlm.nih.gov/books/NBK537239/#_NBK537239_pubdet_. Acesso em 11 de abr. de 2023.

SLEIGH, Bryan C.; MANNA, Biagio. Lymphedema. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan. Disponível em: https://www.ncbi.nlm.nih.gov/books/NBK537239/.

SMITH,C, et al. Clinical manifestations and evaluation of edema in adults, UpToDate, 2023. Disponível em: https://www.uptodate.com/contents/clinical-manifestations-and-evaluation-of-edema-in-adults?search=LINFEDEMA%20DIAGNOSTICO&source=search_result&selectedTitle=5~150&usage_type=default&display_rank=5. Acesso em: 11 de out. de 2023.

STERNS, Rudolf et al. Pathophysiology and etiology of edema in adults UpToDate, 2023. Disponível em: https://www.uptodate.com/contents/pathophysiology-and-etiology-of-edema-in-adults?search=linfedema%20congenito&topicRef=6096&source=see_link. Acesso em: 11 de out. de 2023.

VALENTINI, Rudolph P.; MATTOO, Tej K.; HOPPIN, Alison G. Pathophysiology and etiology of edema in children. UpToDate, 2022. Disponível em: https://www.uptodate.com/contents/pathophysiology-and-etiology-of-edema-in-children#H24. Acesso em: 12 de abr. de 2023.

WASSEF, Michel et al. Vascular anomalies classification: recommendations from the International Society for the Study of Vascular Anomalies. Pediatrics, v. 136, n. 1, p. e203-e214, 2015.

ZANTEN, Malou Van et al. Milroy disease. GeneReviews® [Internet]. University of Washington, 2021. Disponível em: https://www.ncbi.nlm.nih.gov/books/NBK1239/#_NBK1239_pubdet_. Acesso em 11 de abr. de 2023.

The use of psychotropic medications in the nursing team

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ABSTRACT
The evolution of nursing has been accompanied by the emergence of diseases, especially around mental health. The use of psychotropic medications is the alternative for the treatment of these diseases. The objective of this study is to analyze the use of psychotropic medications in the nursing team and its consequences. This is a literature review, systematic and reflexive, using the descriptors Nursing, Psychotropic Medications and Patient Safety, using the online database. The use of psychotropic substances by nursing professionals is not recent, one of the hypotheses for this habit is the various personalities that make up the nursing team and the risk they are exposed to daily. Anxiety, stress, and sleep disturbances are one of the symptoms that affect these professionals. The use of psychotropic drugs is one of the treatments used for these symptoms, however, these drugs end up being used indiscriminately by nursing professionals, due to the knowledge acquired in the exercise of their profession in relation to these medications, harming the safety of the patient and the professional. It is concluded that the use of psychotropic drugs is not restricted to the hospital area, the absence of supervision of the sale and supply of these drugs does not restrict access, without the need for a medical prescription. The supervision of the use of psychotropic medications, as well as their side effects and the damage they can cause, and finally, therapies aimed at the dependence of these medications, is an alternative to the abusive use of these drugs.

Keywords: Nursing, Psychotropic Medications, Patient Safety.

1 INTRODUCTION

Over the years, the evolution of medicine and nursing has been accompanied by the emergence of other diseases and also by the concern for the mental health of society as a whole. The changes in our body in the face of situations of danger and threat are mechanisms of our body, causing physical and emotional changes, which are defined as stress. Stress is nothing new in healthcare, research has shown the study since the 1950s:

> The first definitions of stress date back to the mid-1950s, and initially classified stress as a non-specific neuroendocrine response of the organism. Later, however, it was considered a

> response that involved other systems of the human body, mainly cardiovascular, pulmonary, and renal. Such systems, when affected, suggest a great risk for the development of diseases that prevent or limit the permanence of the worker in the work environment. As a result, stress becomes a public health problem (MORAES FILHO *et al*, 2019, p. 2.)

Because it is a risk factor for the onset of diseases, medicine and the pharmaceutical industry have sought resources in medications to relieve the signs and symptoms of stress, which has been called psychotropic medications. The knowledge of nursing professionals about the effects and form of administration of these medications is a facilitator in how to use them, and therefore, the use is often carried out deliberately.

The use of psychotropic substances by health professionals, as well as by nursing workers, is not a recent event:

> The abusive consumption of psychotropic drugs among health professionals is not a recent fact, reports indicate that in 1833 the medical community had its risk of death increased due to complications arising from cirrhosis and intoxication, consequent to the excessive use of medications in this group. One hundred years later, in 1933, anesthesiologists were diagnosed with high consumption of opioids, and this behavior spread among other categories of health workers. (CAIXETA, SILVA and ABREU, 2021, p.189)

The aggravation of mental illnesses is notably accentuated every year, and nursing professionals are often absent from their work activities when they seek medical help or self-medication.

> The World Health Organization (WHO) estimates that more than 264,000 people worldwide are affected by depression, which is responsible for about 800,000 suicides per year. Added to this, it is estimated that 3.4% of the global population has an anxiety disorder. (NASCIMENTO, FERREIRA and BATISTA, *apub* WHO, 2021, p.136).

The use of psychotropic medications, when performed abusively, can put the safety of the patient and the professional at risk, which is the objective of our study, which is to analyze the use of psychotropic medications in the nursing team and its consequences.

2 DEVELOPMENT

The manuscript systematically and reflexively seeks the use of psychotropic medications by nursing professionals, through a methodology outlined and the bibliographic references available in the online database .

2.1 METHODOLOGY

The present study is a bibliographic, systematic and reflexive review, divided into two stages, in the first stage the descriptors Nursing and psychotropic medications were used, in which nine articles were selected from a total of 565 articles, after using the filters Portuguese language, full text and

publications that occurred in the last five years. In the second stage, we used the descriptors psychotropic medications and patient safety, resulting in a single article out of 245 studies, after using the same filters as in the selection of the first stage. The manuscripts were selected from the databases of the Virtual Health Library (VHL).

The choice of categories was due to the low number of studies found in the use of the descriptors already used. For a better analysis of the results, descriptors were chosen, which are the starting points for finding the answers to the initial question of this study.

2.2 RESULTS AND DISCUSSION

The data collected in this study refer to the use of psychotropic substances by nursing professionals. For a better understanding of the results found, we present the table (Chart 1); below:

TITLE	AUTHORS (Year)	DESIGN OF STUDY	OBJECTIVE
Safety of Patients with Mental Disorders: Construction of Collective Strategies	VANTIL, Fernanda Cordeiro Sirtoli, *et al.* (2020)	This is a qualitative study using the *COREQ criteria.*	To describe the implementation of risk management in the safety of patients with mental disorders through action research.
The use of psychoactive drugs among health professionals	COELHO, Amanda Soares, *et al.* (2022)	This is an integrative, qualitative and exploratory review.	To relate the use of psychoactive substances by health professionals and their impacts on health and professional life.
Consumption of psychotherapies in the midst of a Sars-COV-2 pandemic	OLIVEIRA, Fernanda Pinto Dantas; SANTOS, Fernando Maia Pereira; DALLAQUA, Bruna (2021)	Literature review study.	To identify whether the pandemic generated by SARS-COV-2 influenced the use of psychotropic drugs during the period of isolation by the population.
The use of psychotropic substances among nursing professionals	SOUZA, Aline Braga *et al.* (2020)	This is a cross-sectional, quantitative study.	To analyze how the use of these psychotropic substances is present in the lives of nurses.
Analysis of post-traumatic stress disorder in nursing professionals during the COVID-19 pandemic	ALMEIDA, Thaynara Fontes, *et al.* (2022)	This is an observational, analytical, and cross-sectional study using the *STROBE criteria*.	To analyze the prevalence of Post-Traumatic Stress Disorder (PTSD) and the factors associated with the development of PTSD in nurse practitioners during the COVID-19 pandemic.
Use of psychotropic medications by nursing professionals working in an urgent and emergency unit	SANTOS, Maria Paula Bernado dos, *et al.* (2023)	This is an exploratory, cross-sectional field research study with quantitative data analysis.	OBJECTIVE: To investigate the occurrence of the use of psychotropic medications and the related factors in a nursing team working in an Urgency and Emergency Unit.
Association of occupational stress and	MORAES FILHO, Iel Marciano de, *et al.* (2019)	Cross-sectional, analytical and quantitative study.	OBJECTIVE: To analyze the association between the level of occupational

use of psychotropic drugs by health professors			stress and the use of psychotropic drugs by health teachers.
Depression, anxiety and the use of psychotropic drugs in nursing professionals: an integrative review	NASCIMENTO, Antony Santos; FERREIRA, Kaellen Gomes Almeida; BATISTA, Jefferson Felipe Calazans. (2021)	Integrative review study.	OBJECTIVE: To analyze the factors involved in the development of depression, anxiety and the use of psychoactive substances (PAS) by nursing professionals.
Abusive use of psychotropic drugs by health professionals	CAIXETA, Aldinei Cotrim; SILVA, Raiane da Costa; ABREU, Clézio Rodrigues de Carvalho. (2021)	This is an integrative review with a qualitative research approach.	Identify the factors that favor the abuse of psychoactive substances by health professionals.
Use of psychoactive substances by health professionals - Nurses	ANDRADE, Graziely Sardou Pereira; PINTO, Kauanny da Silva; BARRETO, Carla Alessandra. (2019)	This is an exploratory research study with a qualitative approach of exploratory literature review.	To discuss the use of psychoactive chemicals among health professionals who work as nurses and whether the use of these substances occurs due to the ease of access to medications or the stress caused by the work environment.

The present study reviewed ten articles addressing the use of psychotropic drugs by nursing professionals, a theme proposed by this manuscript. For a better understanding, in the course of this article, we will address what each research reports on the theme proposed for reflection in this study.

The use of psychotropic substances by health professionals, as well as by nursing workers, is not a recent event:

> The abusive consumption of psychotropic drugs among health professionals is not a recent fact, reports indicate that in 1833 the medical community had its risk of death increased due to complications arising from cirrhosis and intoxication, consequent to the excessive use of medications in this group. One hundred years later, in 1933, anesthesiologists were diagnosed with high consumption of opioids, and this behavior spread among other categories of health workers. (CAIXETA, SILVA and ABREU, 2021, p.189)

Nursing is an activity that deals with different personalities and behaviors, in the face of all kinds of risks to which life is exposed. In view of the exposure to these behaviors, we highlight:

> [...] the nurse performs an extremely exhausting activity, with an intense routine and great responsibility, which ends up generating situations of anxiety, which affect the individual in such an advanced way as to stimulate the use of psychoactive substances in an attempt to relieve daily tensions. (SOUZA *et al*, 2020, p.7)

The nursing team, being involved in patient care, whether of low or high complexity, ends up fulfilling an extensive workload, leaving little time for leisure or activities that relieve the emotional overload that the work requires:

> The emotional exhaustion resulting from such situations can contribute significantly to the development of conditions related to stress and mental disorders, such as depression, anxiety, panic, phobia and psychosomatic diseases, and the use of psychoactive substances may be used to cope with and seek relief from these problems. (ANDRADE, PINTO and BARRETO, 2019, p. 591)

Research data quantify that only 1/4 of nursing professionals do not qualify their work as stressful, as highlighted in the 2021 manuscript:

> [...] nursing is constantly in contact with suffering, pain and anxieties that can channel physical and mental suffering, in addition, the provision of services with professional devaluation and lack of recognition are also associated factors, such evidence is demonstrated in the study by Lemes et al. (2015) where 88% of professionals reported stressful work and 22% pointed out inadequate working conditions. (NASCIMENTO, FERREIRA and BATISTA, 2021, p.137)

Several factors end up affecting the mental health of health professionals, generating concern about the safety of patients when receiving care from these professionals and, at the same time, the safety of professionals when performing care.

> Examples include physical fatigue, high level of demand, enormous demands, excessive workload, among other factors. All of this ends up having psychological effects, such as anxiety and stress, as well as changes in sleep quality. (RABBIT *et al*, 2022, p.6)

Regarding patient safety, extra care is needed in relation to patients with mental health problems:

> In Mental Health care, it is necessary to have a differentiated management, given that the public served has a profile that can predispose to the occurrence of some events, and that can even be harmful to the patient, such as self-aggression, violence and suicide. (VANTIL *et al,* 2020, p.2)

It is known that the routine wear and tear of nursing professionals is under constant discussion in today's society, especially after the advent of the COVID-19 Pandemic:

> tag. Healthcare workers are subject to greater psychological distress as a result of working on the front lines in response to the pandemic. In addition, the challenges imposed by this scenario intensify stressful factors, such as the lack of Personal Protective Equipment (PPE), the restricted number of beds and mechanical ventilators, the lack of knowledge and training, the level of complexity and severity of patients, among other factors. (King James Version)*et al,* 2022, p. 3)

A study conducted in the year after the pandemic shows the increase in the consumption of anxiolytic and sleeping pills, as well as herbal medicines:

> [...] A study conducted in pharmacies in Mato Grosso shows a 40% increase in the sale of medicines such as Fluoxetine and Alprazolam between March and August 2020, in addition to the increase in the sale of herbal medicines aimed at controlling the symptoms of anxiety and depression, generating a correlation with an increase not only in individuals properly diagnosed with disorders such as depression and anxiety by professionals, but also warning

> of an increase in self-medication with substances that do not require a prescription, such as herbal medicines. (OLIVEIRA, SANTOS and DALLAQUA, 2021, p.4)

In view of the challenges imposed by the pandemic, in addition to the existing ones, it was observed that during the pandemic the risk of nursing professionals developing mental disorders increased considerably:

> A study shows that health professionals who provide care to patients with COVID-19, confirmed or suspected, lack attention from health authorities regarding the identification and monitoring of these groups that are at high risk for developing emotional and psychiatric problems. Above all, nurses and nursing technicians, who, although accustomed to facing critical situations, worked directly on the front line during the pandemic, which often negatively affected the mental health of these professionals. (King James Version)*et al*, 2022, p. 6)

A. anxiety experienced by nursing professionals, in the face of the execution of their activities, can generate several mental disorders, such as Mental and Behavioral Disorders (CMD), as reported in the 2023 study:

> Health professionals, especially nursing professionals, are the most likely to develop CMDs because they are involved daily in situations that cause stress, related to a large workload, physical and psychological exhaustion, in addition to excessive demands on their work routine. As a result of this stressful work, these people are prone to use psychotropic drugs. (SAINTS *et al*, 2023, p.196)

Mental distress on the part of nursing professionals has been present since before the pandemic, due to factors already mentioned in this study, but it was observed that these intensify in areas where emotional overload is greater, but variable from individual to individual.

> [...] It has been common to find these professionals going through a process of mental illness, with an increasing number of cases of depression, various anxiety syndromes, insomnia, suicidal behavior, burnout syndrome, psychotic episodes, as well as excessive use of alcohol and other drugs. (SAINTS *et al*, 2023, p.197)

Studies indicate that alcohol is the illicit substance most used by nursing professionals, this is due to its easy access and because it is considered a "normal" social practice when within limits.

> [...] Studies have pointed to alcohol as the predominant substance among nursing professionals. It is known that intense and discriminated alcohol consumption can be harmful to the health of any individual, however, it is pointed out that about 52% of the Brazilian population over 18 years of age consumes some alcoholic beverage (at least once a year). This context is cultural, however the use can be associated as a refuge to personal and mainly work problems. (NASCIMENTO, FERREIRA and BATISTA, 2021, p.143)

It is observed that the use of psychotropic drugs is not restricted only to the hospital environment, but is also seen in the academic area, due to the great pressure that professors suffer to improve indicators and institutional evaluations.

> The pressure to prove the professional's efficiency to complete the methods of institutional evaluations causes stress in the teacher. Thus, the first definitions of stress date back to the mid-fifties, and initially classified stress as a non-specific neuroendocrine response of the organism. (MORAES FILHO *et* al,2019, p.2)

The stress level of teaching professionals is due to a set of factors, in the search for a comfortable standard of living, the vast majority having more than one job and work overload.

> The level of stress can make the professional incapacitated, because the pressure and stress experienced in their work environment do not prevent the professional from wanting to do their best to guarantee their job, even in the face of work overload, conflicts, professional devaluation and double workload, but all these factors contribute to the professional making use of psychoactive substances. (MORAES FILHO *et al,* 2019, p.7)

In the search for better professional results, they end up making use of psychotropic medications, sometimes becoming dangerous due to their possible side effects.

> [...] the exacerbated use of medications and polypharmacy may be predictive factors for decreased quality of life and longevity, due to the lack of knowledge of adverse effects. In this context, these factors are a public health problem, and it is necessary to implement effective and inherent public policies to reduce medicalization and value the use of alternative methods, providing coping with the praxis experienced and the significant improvement of the individual in moral distress. (MORAES FILHO *et al*, 2019, p.7)

In sum, the losses are still unknown by the health and educational institutions of the country, due to the abusive use of psychotropic drugs by their employees, but it is believed to be enormous and also a public health problem.

3 CONCLUSION

The abusive consumption of psychotropic drugs in the health area, thus inserting Nursing, in this context, is not new, however, the consumption has become a public health problem, but without much interest on the part of government agencies.

The different personalities that make up a nursing team, as well as teams with several members, sometimes living together for up to 12 hours per shift, end up creating a stressful work environment, adding to an extensive work demand, leaving the professional mentally ill. This, in turn, often resorts to self-medication, due to their knowledge of medications, which does not end up being recorded in the statistics. When professionals resort to specialized medical care, they are sometimes removed from their work functions, causing damage to the institution and public coffers.

The event of the pandemic increased the evidence on the consumption of these medications, believed by frontline professionals, such as Nursing, and then by the psychic and mental suffering faced by nursing professionals in the face of an unknown disease.

The abuse of psychotropic medications is a concern among nursing professionals, due to their working hours, due to their side effects and putting the safety of the professional and the patient at risk.

It is concluded that the use of psychotropic drugs is not restricted only to the hospital area, the absence of supervision of the sale and supply of these drugs does not restrict access to them, often occurring the deliberate sale, without the need for a medical prescription. As a suggestion, the increase in supervision is undoubtedly a factor to be worked on, allied to this, the increase in information about the use of psychotropic medications, as well as their side effects and the damage they can cause, and finally, therapies aimed at dependence on these medications.

REFERENCES

ANDRADE, Graziely Sardou Pereira; PINTO, Kauanny da Silva; BARRETO, Carla Alessandra. Uso de substâncias psicoativas por profissionais da saúde- Enfermeiros. Revista Saúde em Foco; 2019. Disponível em: https://portal.unisepe.com.br/unifia/wp-content/uploads/sites/10001/2019/05/053_USO-DE-SUBST%C3%82NCIAS-PSICOATIVAS-POR-PROFISSIONAIS-DA-SA%C3%9ADE-ENFERMEIROS

ALMEIDA, Thaynara Fontes, et al. Análise do transtorno do estresse pós-traumático em profissionais de enfermagem durante a pandemia da COVID-19. Texto Contexto Enferm [Internet]. 2022; 31:e20220139. Disponível em: https://doi. org/10.1590/1980-265X-TCE-2022-0139pt

CAIXETA, Aldinei Cotrim; SILVA, Raiane da Costa; ABREU, Clézio Rodrigues de Carvalho. Uso abusivo de psicotrópicos por profissionais da saúde. Revista JRG de Estudos Acadêmicos, Brasil, São Paulo, v. 4, n. 8, p. 188–200, 2021. DOI: 10.5281/zenodo.4627867. Disponível em: https://revistajrg.com/index.php/jrg/article/view/227

COELHO, Amanda Soares, et al. O uso de medicamentos psicoativos entre os profissionais da saúde. E-Acadêmica, *[S. l.]*, v. 3, n. 2, p. e1432165, 2022. DOI: 10.52076/eacad-v3i2.165. Disponível em: https://eacademica.org/eacademica/article/view/165

MORAES FILHO, Iel Marciano de, et al. Associação de estresse ocupacional e uso de psicotrópicos por docentes da área da saúde. Revista Brasileira em Promoção da Saúde, *[S. l.]*, v. 32, 2019. DOI: 10.5020/18061230.2019.9007. Disponível em: https://ojs.unifor.br/RBPS/article/view/9007

NASCIMENTO, Antony Santos; FERREIRA, Kaellen Gomes Almeida; BATISTA, Jefferson Felipe Calazans. Depressão, ansiedade e o uso de psicotrópicos em profissionais de enfermagem: Revisão integrativa. Caderno de Graduação - Ciências Biológicas e da Saúde - UNIT - SERGIPE, *[S. l.]*, v. 7, n. 1, p. 135–148, 2021. Disponível em: https://periodicos.set.edu.br/cadernobiologicas/article/view/10318

OLIVEIRA, Fernanda Pinto Dantas; SANTOS, Fernando Maia Pereira; DALLAQUA, Bruna. Consumo de psicotrópicos em meio a uma pandemia de Sars-COV-2. Revista PubSaúde; 2021. Disponível em: https://dx.doi.org/10.31533/pubsaude7.a187

SANTOS, Maria Paula Bernado dos, et al. Uso de medicamentos psicotrópicos por profissionais de enfermagem atuantes em uma unidade de urgência e emergência. Conjecturas, *[S. l.]*, v. 23, n. 1, p. 194–208, 2023. Disponível em: https://conjecturas.org/index.php/edicoes/article/view/2354

SOUZA, Aline Braga et al. O uso de substâncias psicotrópicas entre os profissionais de enfermagem. Debates em Psiquiatria, Rio de Janeiro, v. 10, n. 1, p. 6–13, 2020. DOI: 10.25118/2236-918X-10-1-1. Disponível em: https://revistardp.org.br/revista/article/view/40

VANTIL, Fernanda Cordeiro Sirtoli, et al. Segurança do Paciente com transtorno mental: construção de estratégias coletivas. Revista Bras. De Enferm; 2020. Disponível em: https://doi.org/10.1590/0034-7167-2017-0905

SEVEN
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Prevention techniques and effective management of diabetic foot: A literature review

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ABSTRACT
In the context of diabetic foot, peripheral neuropathy plays a crucial role. The loss of sensitivity and muscle strength in the feet due to neuropathy increases the risk of ulcers. Additionally, peripheral vascular disease and immunodeficiency are risk factors, making diabetic patients more susceptible to complications. Diabetic foot prevention involves a multidisciplinary approach, including regular foot exams, self-care education, lifestyle changes such as quitting smoking, keeping the feet clean and dry, wearing appropriate socks and comfortable shoes. Local care, including ulcer debridement and the proper choice of dressings, is essential for healing. Negative pressure therapy may be an option in severe cases. Furthermore, other conditions, such as Charcot arthropathy, venous stasis, deep vein thrombosis, and fractures, can be confused with diabetic foot infections and require differentiation through medical history, physical examination, and imaging studies. In summary, diabetes mellitus is a global health concern, with serious complications like diabetic foot. Prevention, education, and proper treatment play fundamental roles in managing this condition.

Keywords: Diabetic foot, Self-care, Prevention, Complications, Multidisciplinary.

1 INTRODUCTION

Type 1 diabetes or autoimmune diabetes. However, some patients with an absolute deficiency of insulin do not show evidence of autoimmunity, and they do not have any other known cause for the destruction of beta cells. The classification system of the American Diabetes Association (ADA) uses the term "idiopathic diabetes" or "Type 1B" to refer to these patients, who may encompass a range of non-autoimmune pathophysiological processes that lead to almost complete loss of beta cell function (COSTA; MOREIRA, 2021).

Type 2 diabetes is the most common phenotypic form of diabetes. Diabetes mellitus (DM) is a growing problem worldwide, regardless of the developmental status of the countries. In Brazil,

approximately 12.5 million people have DM, with an estimated progression to around 20.3 million comorbidity cases by 2045 (BRASIL, 2019).

With the significant increase in DM cases, complications inherent to the condition are also advancing, including foot-related disorders. Diabetic foot is a wound aggravated by an infection or other causes of neurological, vascular, or orthopedic origin. Typically, the problem occurs over time in comorbidity, leading to neuropathy along with poor perfusion, making patients more prone to injuries that they may not identify due to local insensitivity (MATTOS et al., 2019).

If diabetic foot is not treated properly, it naturally progresses to the development of ulcers, which can lead to amputations. Consequently, hospitalizations resulting from this complication are becoming more frequent, incurring high costs to public finances (MATTOS et al., 2019). Specialized attention is required to manage this condition and prevent the progression of diabetic foot, a complication that reduces the quality of life for patients.

2 PERIPHERAL NEUROPATHY

Pancreatic physiology is divided into two portions, one endocrine and the other exocrine, with the majority of pancreatic mass consisting mostly of acinar cells organized in acini. Acinar cells synthesize inactive digestive enzymes such as amylases, proteases, lipases, and nucleases. These enzymes are subsequently secreted into the pancreatic ducts and transported to the duodenum for activation. The duct cells produce mucus and bicarbonate-rich fluids, which are useful for neutralizing stomach acid (COSTA; MOREIRA, 2021).

The pancreas, in its endocrine function, is regulated by clusters of cells scattered within the pancreatic acinar tissue, known as the Islets of Langerhans. There are at least six types of pancreatic cells described. Among them, alpha cells make up about 15-20% of the islet cells and synthesize and secrete glucagon, glicentin, GRPP (glycentin-related pancreatic peptide), GLP-1, and GLP-2 (glucagon-like peptide 1 and 2). Beta cells are the most numerous, accounting for approximately 70-80% of the pancreatic islet cells. They are responsible for the synthesis and secretion of insulin and C-peptide, and to a lesser extent, they produce amylin, also known as IAPP (islet amyloid polypeptide), which acts as an insulin antagonist, among other peptides. Delta cells represent 5-10% of the cells (Montenegro JR et al., 2016).

Type 2 diabetes is responsible for over 90% of diabetes cases in the United States, Canada, and Europe. Type 1 diabetes accounts for another 5 to 10%, with the remaining cases attributed to specific etiological or pathophysiological factors. Known monogenic causes of diabetes (e.g., those causing maturity-onset diabetes of the young or neonatal diabetes) represent only a small fraction of cases. The genetic foundations of the common forms of Type 1 and Type 2 diabetes remain complex, with common gene variants contributing individually to only small degrees of risk or protection. A wide

range of phenotypic forms of diabetes with uncertain pathophysiology is emerging, which does not fit clearly into the Type 1 or Type 2 diabetes categories, collectively referred to as "atypical diabetes." Furthermore, the global epidemic of overweight and obesity has superimposed the pathophysiology of Type 2 diabetes on all other types (PERMUTT et al., 2019).

Type 1 diabetes is characterized by the destruction of pancreatic beta cells, leading to an absolute deficiency of insulin. This typically occurs due to autoimmune destruction of beta cells (Type 1A). Testing for islet cell antibodies (ICA) or other islet autoantibodies (antibodies to glutamic acid decarboxylase 65 [GAD65], insulin, tyrosine phosphatases, insulinoma-associated protein 2 [IA-2], IA-2 beta, and zinc transporter [ZnT8]) in the serum is important. A positive result is generally indicative of autoimmunity. Type 1 diabetes can occur in both children and adults and is characterized by hyperglycemia and varying degrees of insulin resistance and deficiency. Its prevalence increases significantly with the rise in the number of obese individuals. Insulin resistance and insulin deficiency can result from genetic or environmental influences, making it difficult to determine the exact cause in an individual patient. Furthermore, hyperglycemia itself can impair pancreatic beta cell function and worsen insulin resistance, a condition known as "glucotoxicity" (JUNIOR et al., 2020).

With the increasing prevalence of diabetes worldwide, distinguishing between Type 1 diabetes and atypical presentations of Type 2 diabetes has become increasingly challenging. Patients with Type 1 diabetes may develop an absolute need for insulin treatment over time. However, many Type 2 diabetes patients may experience beta cell dysfunction over time and require insulin for glycemic control (COSTA; MOREIRA, 2021).

Patients with Type 1 diabetes may coincidentally exhibit pathophysiological elements of Type 2 diabetes. In the past, poor metabolic control of Type 1 diabetes prevented most of these patients from experiencing weight gain. Intensive therapy now commonly used to control Type 1 diabetes has resulted in an increasingly similar prevalence of overweight and obesity in the Type 1 diabetes population and the non-diabetic population. Insulin resistance and other characteristics of Type 2 diabetes may be exhibited in such Type 1 diabetes patients, especially those with a family history of Type 2 diabetes (PENNA; HERMSDORFF; SARON, 2020).

2.1 PREVENTION OF DIABETIC FOOT ULCERS

It is estimated that 10 to 25% of the population with diabetes mellitus over the age of 70 develops foot lesions, and among them, 14 to 24% require amputation. This is a common cause of disability due to amputations, which significantly reduce the quality of life (MUZY et al., 2021).

The prevention of ulcers begins with regular foot examinations and public education, which can reduce the severe cases by half. Diabetics should frequently inspect their feet to check for the

presence of punctures, cuts, swelling, redness, excessive dryness, and discoloration (VICENTIN et al., 2020).

In addition to observation, lifestyle changes should be encouraged, such as quitting smoking, washing the feet with warm water, thorough drying of the feet including between the toes, avoiding the use of local alcohol and other substances that tend to dry the skin, cutting nails straight without leaving sharp edges, using seamless and elastic cotton socks, avoiding tight-fitting shoes, and being cautious about insects. The multidisciplinary team should guide patients with diabetes mellitus regarding the care and potential complications associated with non-compliance with appropriate treatment (RAMIREZ-PERDOMO; PERDOMO-ROMERO; RODRÍGUEZ-VÉLEZ, 2019).

Deep ulcers with chronic infections and/or prior antibiotic treatment are more likely to be caused by various pathogens. Wounds with extensive local inflammation, necrosis, foul-smelling drainage, or gangrene with signs of systemic toxicity should be presumed to have anaerobic organisms in addition to the above-mentioned pathogens. Potential pathogens include anaerobic streptococci, Bacteroides species, and Clostridium (WEINTROB et al., 2023).

Local care is an important mechanism to prevent worse outcomes. Debridement of necrotic tissue is essential for ulcer healing. The frequency of assessments and appropriate care can contribute more to wound healing than the type of debridement. Sharp debridement, the most widely used method, involves the use of a scalpel or scissors to remove necrotic tissue. Alternatively, the application of a hydrogel is suggested, but data supporting its effectiveness in promoting wound healing are limited. Enzymatic debridement (topical application of proteolytic enzymes like collagenase) may be more appropriate in certain scenarios (e.g., extensive vascular disease). Autolytic debridement can be a good option for patients with painful ulcers, using a semi-occlusive or occlusive dressing to cover the ulcer so that necrotic tissue is digested by enzymes naturally present in the wound tissue (ARAUJO; FILHO; BRANDÃO, 2022).

After debridement, ulcers should be kept clean and moist, but not excessively wet. Dressings should be selected based on ulcer characteristics, such as the extent of exudate, excessive dryness, or necrotic tissue. Some dressings simply provide protection, while others promote wound hydration or prevent excessive moisture. Adjunct therapies can help improve the healing of diabetic foot ulcers, including negative pressure wound therapy for extensive open wounds after debridement for infection and necrosis, or after partial foot amputation, provided there is no residual necrotic tissue or osteomyelitis. This technique involves the application of controlled subatmospheric pressure to the ulcer's surface, improving healing and increasing wound perfusion, reducing edema, reducing local bacterial load, and enhancing granulation tissue formation. This technique improves healing by reducing the duration of hospitalization, major complication rates, and costs (ARMSTRONG et al., 2022).

Several other conditions can lead to changes in the lower limb skin and may mimic an infection. Charcot arthropathy can be acute or chronic, and patients often present with sudden onset of unilateral warmth, redness, and swelling in the foot or ankle, often with a history of minor trauma. The affected foot may be notably warmer than the healthy contralateral foot. Alternatively, in some cases, patients may have a slow-progressing arthropathy with insidious onset of swelling over months or years. Occasionally, acute recurrent attacks may occur. The most frequently affected joints are the tarsal and tarsometatarsal joints, followed by the metatarsophalangeal joints and the ankle (MUÑOZ-DE-LA-CALLE; VIADÉ-JULIÀ, 2020).

In addition to Charcot arthropathy, venous stasis, deep vein thrombosis, and fractures can be differential diagnoses for diabetic foot. Generally, these conditions can be differentiated from infection based on clinical history, physical examination, and imaging findings. However, infection may coexist with other processes, and empirical antimicrobial therapy may be justified in some cases when the diagnosis is uncertain (WEINTROB et al., 2023).

REFERENCES

ARAUJO, Thiago Moura; FILHO, Manoel Luiz Da Silveira; BRANDÃO, Maria Girlane Sousa Albuquerque. Tratamento de lesões nos pés de pessoas com diabetes mellitus no cenário brasileiro: revisão integrativa. Revista Enfermagem Atual In Derme, v. 96, n. 39, p. e–021274, 2022. Disponível em: https://revistaenfermagematual.com/index.php/revista/article/view/1093/1447.

ARMSTRONG, David G. et al. Management of diabetic foot ulcers. Up To Date [Internet], 2022. Disponível em: https://www.uptodate.com/contents/management-of-diabetic-foot-ulcers. Acesso em: 13/05/2023.

BRASIL. Diretrizes da Sociedade Brasileira de Diabetes 2019-2020. Brasília: Sociedade Brasileira de Diabetes, 2019. 491 p. ISBN: 978-85-93746-02-4

BRASILEIRO, José Lacerda et al. Pé diabético: aspectos clínicos. Jornal vascular brasileiro, v. 4, n. 1, p. 11-21, 2019.

CORREIA, Emanuel de Freitas et al. Principais fatores de risco para amputação de membros inferiores em pacientes com pé diabético: uma revisão sistemática. Research, Society and Development, v. 11, n. 8, p. e59511831599-e59511831599, 2022.

COSTA, Bianca Barros da; MOREIRA, Thamyris Almeida. Principais aspectos fisiopatológicos e clínicos presentes no Diabetes mellitus tipo I (autoimune). Research, Society and Development, v. 10, n. 14, 2021.

CUBAS, Marcia Regina et al. Pé diabético: orientações e conhecimento sobre cuidados preventivos. Fisioterapia em Movimento, v. 26, n. 3, p. 647–655, 2013. Disponível em:https://www.scielo.br/j/fm/a/53WdYvfKFMtgKRMPByXGH3q/?lang=pt. Acesso em: 13 maio 2023.

FÉLIX, Victor Hugo Cardoso; OLIVEIRA, Francielle Temer de; MENEZES, Erika de Oliveira. Importância da avaliação do pé diabético na prevenção de lesões e amputações. Brazilian Journal of Health Review, v. 3, n. 6, p. 19260-19283, 2020.

FERREIRA, Ricardo Cardenuto. Pé diabético. Parte 1: Úlceras e Infecções*. Revista Brasileira de Ortopedia, v. 55, n. 04, p. 389–396, 2020. Disponível em: https://www.scielo.br/pdf/rbort/v55n4/pt_1982-4378-rbort-55-04-0389.pdf. Acesso em: 10/04/2023

GOMES JUNIOR, Salvador Viana et al. Revisão sobre a eficácia e segurança no uso de inibidores de co-transportadores de sódio-glicose-2 na fisiopatologia da diabetes mellitus tipo II/Review on the effectiveness and safety in the use of sodium-glucose-2 co-carrier inhibitors in the pathophysiology of diabetes mellitus type II. Brazilian Journal of Health Review, v. 3, n. 2, p. 2544-2562, 2020.

MATTOS, Ligia et al. Infecção no pé diabético. Diretriz Oficial da Sociedade Brasileira de Diabetes, 2022. Disponível em: https://diretriz.diabetes.org.br/infeccao-no-pe-diabetico/#citacao. Acesso em: 05/02/2023.

MUÑOZ-DE-LA-CALLE, José Fernando; VIADÉ-JULIÀ, Jordi. Artropatía de Charcot en el paciente diabético. Revisión de Conceptos Actuales. Revista Colombiana de Ortopedia y Traumatología, v. 34, n. 1, p. 5-15, 2020. Disponível em: https://www.sciencedirect.com/science/article/abs/pii/S0120884520300456; Acesso em: 22/02/2023.

MUZY, Jéssica *et al*. Prevalência de diabetes mellitus e suas complicações e caracterização das lacunas na atenção à saúde a partir da triangulação de pesquisas. Cadernos de Saúde Pública, v. 37, n. 5, 2021. Disponível em: https://www.scielo.br/j/csp/a/B9Fhg54pjQ677YVx9g3mHwL/?lang=pt&format=pdf. Acesso em: 27/03/2023.

OLIVEIRA, Bianca Campos et al. Cicatrização de feridas diabéticas com fator de crescimento epidérmico: revisão integrativa. Enferm. foco (Brasília), p. 1-7, 2022.

PENNA, Paula Moreira; HERMSDORFF, Helen Hermana Miranda; SARON, Margareth Lopes Galvão. O papel de adipocinas na relação entre obesidade e resistência à insulina: uma revisão integrativa. Cadernos UniFOA, v. 15, n. 42, p. 131-141, 2020.

PERMUTT, M. Alan et al. Genetic epidemiology of diabetes. The Journal of clinical investigation, v. 115, n. 6, p. 1431-1439, 2019.

RAMIREZ-PERDOMO, Claudia; PERDOMO-ROMERO, Alix; RODRÍGUEZ-VÉLEZ, María. Conhecimentos e práticas para a prevenção do pé diabético. Revista Gaúcha de Enfermagem, v. 40, 2019.

SADER, Hélio S.; DURAZZO, Anaí. Terapia antimicrobiana nas infecções do pé diabético. Jornal Vascular Brasileiro, v. 2, n. 1, p. 61-66, 2020.

SCHAPER, Nicolaas C. et al. IWGDF practical guidelines on the prevention and management of diabetic foot disease. Diabetes Metab. Res. Rev, 2019. Disponível em: https://iwgdfguidelines.org/wp-content/uploads/2019/05/01-IWGDF-practical-guidelines-2019.pdf. Acesso em: 03/03/2023

VICENTIN, Daiani Vieira et al. Prevenção e tratamento do pé diabético: Uma revisão. Referências em Saúde da Faculdade Estácio de Sá de Goiás-RRS-FESGO, v. 3, n. 2, 2020.

WEINTROB, Amy C et al. Clinical manifestations, diagnosis, and management of diabetic infections of the lower extremities. UpToDate [Internet], 2023. Disponível em: https://www.uptodate.com/contents/clinical-manifestations-diagnosis-and-management-of-diabetic-infections-of-the-lower-extremities?search=p%C3%A9%20diab%C3%A9tico%20&source=search_result&selectedTitle=3~116&usage_type=default&display_rank=3. Acesso em:13/05/2023

ZÖRRER, Luís Augusto Barbosa Franco et al. Fatores associados ao maior risco de ulceração nos pés de indivíduos com diabetes mellitus. Medicina (Ribeirão Preto), v. 55, n. 1, 2022.

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Clinical and epidemiological profile of patients affected by chikungunya admitted to a referral hospital for infectious diseases

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ABSTRACT

Introduction: Chikungunya (CHIK) is an infectious disease caused by the CHIK virus, an alphavirus belonging to the Togaviridae family, transmitted through the infected bite of the Aedes aegypti and Aedes albopictus mosquitoes. Objective: To describe the clinical and epidemiological profile of patients affected by chikungunya admitted to a referral hospital for infectious diseases. Methods: Cross-sectional and descriptive research with a quantitative approach. The population consisted of neonates, children and adults with a laboratory-confirmed diagnosis of chikungunya and who were admitted to a referral hospital from 2015 to 2018. Data were collected from medical records and the SINAN and LACEN Information Systems. The analysis was performed through the frequency distribution. Results: The profile of the 52 patients showed that 30 (57%) lived in Fortaleza, 29 (55.8%) were female, the predominant age group was between 0 and 10 years old, with 27 (51%) , 24 (46.2%) were brown. 27 (51.9%) did not start their school activities because of their age. As for signs and symptoms, the most prevalent was fever 51 (98%). As for comorbidities, 41 (78.85%) had no comorbidities. As for the admission criterion, 18 (36.4%) were neurological involvement. Regarding the outcome, 49 (94%) were discharged from hospital. Conclusion: Of those hospitalized, there was a higher prevalence in female children in the preschool phase, of mixed color and living in urban areas. Regarding the admission criteria, a large number of patients with neurological impairment were evidenced and who progressed to discharge.

Keywords: Chikungunya Virus, Sociodemographic Variables, Pathological Conditions, Signs and symptoms, Age Group.

1 INTRODUCTION

Chikungunya (CHIK) is a debilitating arthritic disease characterized by sudden fever and severe arthralgia. It is caused by the Chikungunya virus (CHIKV), which is transmitted by the bite of Aedes Aegypti and Aedes Albopictus mosquitoes. In addition, the disease can be transmitted vertically from mother to fetus or by blood transfusion (MADARIAGA; TICONA; RESURRECION, 2016).

According to the epidemiological bulletin of the state of Ceará, in 2016 there was sustained transmission of *chikungunya* in the state, characterizing an epidemic scenario, with 49,516 suspected cases, of which 63.6% (31,482/49,516) were confirmed, distributed in 139 (75.5%) municipalities (CEARÁ, 2017).

In 2017, there was an increasing trend in reported cases. The incidence rate of suspected cases of *chikungunya* in Ceará was 714.3 cases per 100,000 inhabitants. A total of 64,031 cases were

reported; Of these, 39.9% (25,533/64,031) were confirmed and 8.2% (5,245/64,031) were discarded. Of the confirmed cases, 67.1% (17,131/25,533) were concentrated in the age groups between 20 and 59 years and females were predominant in all age groups, except for those up to 14 years old (CEARÁ, 2017).

The disease can evolve in three phases: acute or febrile (lasting up to 10 days), subacute (11-90 days) and chronic (> 90 days). Approximately 50% of people with acute infection experience develop chronic joint pain that can last for months to years (BRITO *et al.*, 2016).

Severe conditions are often known only after viral circulation in extensive epidemics, often showing an unpredictable impact on morbidity and mortality. Neurological manifestations are fatal complications in patients infected with *chikungunya* virus, even in those without any comorbidity (ROSSO *et al.,* 2016).

Thus, *chikungunya* fever has been constituting new clinical concerns, concerns that should still be observed for a few decades due to the development of the disease itself in those affected, which proves the need for constant updating of studies on the manifestations of the disease. Therefore, the following research question was formulated: What is the clinical and epidemiological profile of patients affected by *chikungunya* admitted to a referral hospital for infectious diseases in the period from 2015 to 2018?.

Therefore, this research seeks to be a source of new concerns not only for the academic community, but also to contribute to broaden research on the subject to the widest range of interested parties.

In the care scenario, there was a lack of studies on this theme, so the importance of surveying the clinical and epidemiological profile of these patients emerged. Given the number and severity of cases during the study period, we intend to contribute to the epidemiological profile.

Thus, the objective of this study is to describe the clinical and epidemiological profile of patients affected by *chikungunya* admitted to a referral hospital for infectious diseases.

2 LITERATURE REVIEW

Chikungunya is an arbovirus caused by the CHIKV virus, of the *Togaviridae family* and the genus *Alphavirus*. Viremia persists for up to ten days after the onset of clinical manifestations. Transmission occurs through the bite of female Aedes *Aegypti* and *Aedes albopictus mosquitoes* infected by CHIKV. Cases of vertical transmission can occur almost exclusively in the intrapartum of viremic pregnant women and often cause severe neonatal infection. Transfusion transmission may occur, but it is rare if the protocols are observed (BRASIL, 2017a).

In 2016, 271,824 probable cases of *chikungunya* fever were registered in Brazil (incidence rate of 133.0 cases/100,000 inhabitants), distributed in 2,829 municipalities, of which 151,318 (55.7%)

were confirmed. In 2017, there were 3,754 probable cases of *chikungunya* fever and an incidence rate of 1.8 cases/100,000 inhabitants; of these, 564 (15.02%) were confirmed. Among the federative units, the states of Ceará (11.4 cases/100,000 inhabitants) and Tocantins (9.2 cases/100,000 inhabitants) stand out. In 2017, 1 death from *chikungunya fever was confirmed* in Bahia (BRASIL, 2017b).

In 2020, 13,636 probable cases were reported (incidence rate of 6.49 cases per 100 thousand inhabitants) in the country. The Northeast and Southeast regions have the highest incidence rates, 8.71 cases/100,000 inhabitants and 7.72 cases/100,000 inhabitants, respectively. The state of Espírito Santo concentrates 22.2% of the probable cases of *chikungunya* in the country, Bahia concentrates 22.6% cases and Rio de Janeiro concentrates 19.0% of the cases (BRASIL, 2020).

According to Reyes, Lechuga and Garces (2015), the transmission cycle is of the human-mosquito-human urban type. This cycle requires infection of female mosquitoes by feeding on the blood of a susceptible vertebrate and viremic host, followed by an extrinsic incubation period and adequate transmission to another vertebrate host during a rear supply. In these events, travelers play an essential role in transmission, since they can carry the causal agent to areas where mosquitoes can transmit the infection.

The signs and symptoms are clinically similar to those of dengue fever – acute-onset fever, joint and muscle pain, headache, nausea, fatigue and rash. The main clinical manifestation that differentiates it is severe joint pain, which can often be accompanied by edema. After the initial phase, the disease can evolve in two subsequent stages: subacute and chronic phases. *Chikungunya* has an epidemic character with a high rate of morbidity associated with persistent arthralgia, resulting in reduced productivity and quality of life (BRASIL, 2017a).

CHIKV can present with atypical manifestations such as: cardiovascular, ocular, gastrointestinal, renal, and neurological impairments, including altered level of consciousness, changes in cranial nerves, seizures, psychosis, hemiparesis, paraplegia, involuntary movements, and Guillain-Barré syndrome (ROSSO *et al*., 2016).

The laboratory diagnosis of CHIKV infection can be made directly, through viral isolation and viral RNA testing in different clinical samples, or indirectly through the search for specific antibodies (BRASIL, 2017b).

According to Chrusri *et al.* (2011), neurological complications are the main causes of death and deficiency in CHIKV, thus causing prolonged hospitalization and secondary complications such as: electrolyte imbalance, pressure injuries, urinary tract infection, aspiration pneumonia and renal changes.

The current disease landscape requires obtaining up-to-date, reliable, and accurate data to warn of the occurrence of outbreaks and related epidemics. Knowledge of the main actions resulting from the implementation of the national Chikungunya surveillance and prevention system may indicate

whether its operation is efficient, in addition to subsidizing, with the results obtained, health planning and decision-making (SILVA *et al*., 2018).

During 2022, there were 108,730 probable cases of *chikungunya* (incidence rate of 51 cases per 100 thousand inhabitants) in Brazil. Compared to 2019, there was a 35.2% increase in cases registered for the same period analyzed. When compared to 2021, there was an increase of 95.7% cases up to the respective week (BRASIL, 2022).

In the state of Ceará, 1,811 suspected cases of chikungunya *were reported in 43.5% (80/184) of the state's municipalities, with 16.0% (286/1,811*) confirmed. Confirmed cases occurred in people aged between 01 and 92 years, 54.2% (155/286) in the age groups of 20 to 49 years, and females were predominant in 68.2% (195/286) of the cases. One death from *chikungunya* was confirmed in February, a 76-year-old male patient living in the municipality of Barbalha (CEARÁ, 2022).

According to São Paulo (2021), neonates are one of the groups at risk of severe infection associated with neurological signs. When infected during maternal-fetal transmission, they are usually asymptomatic at birth, with clinical manifestations that can be mistaken for neonatal sepsis starting between 3 and 7 days later. In addition to neurological alterations (meningoencephalitis, edema, and cerebral hemorrhage), with a risk of persistent damage, fever, prostration, diffuse pain (diffuse hyperalgesia syndrome), severe skin lesions, hemorrhages, pericarditis, and hemodynamic instability may be observed. Children under the age of 2 also tend to have serious illnesses.

The fight against *chikungunya* arbovirus must involve all actors in society, in which there are intervention policies that will involve various sectors, including society, not leaving it only in the hands of the health area.

In addition to vector control measures, effective and continuous surveillance of this arbovirus in the country is also extremely necessary through the maintenance and integration of continuous entomological and epidemiological surveillance, in order to know the current situation of this arbovirus in each region. Thus, it will be possible to analyze the evolution of diseases in the national territory and identify the main sources of disease, in order to plan appropriate measures for control, prevention and awareness of the population. (LIMA-CAMARA, 2016).

3 CHIKUNGUNYA VIRUS DISEASE

3.1 HISTORY AND EPIDEMIOLOGY

3.1.1 Methodology

This is a cross-sectional study, with a quantitative approach, which aims to determine the distribution of diseases or health-related conditions according to time, place and/or characteristics of individuals. The data used for analysis are obtained on a secondary basis from medical records obtained from the Medical Archive and Statistics Service (SAME) and complemented the information not found

through the forms of the Notifiable Diseases Information System (SINAN) - Dengue and *Chikungunya Fever*.

The study was conducted at a referral hospital for infectious diseases, a tertiary public institution and a referral institution for the state of Ceará.

The initial sample consisted of previous data from 81 suspected cases, through a survey in the Medical Archive and Statistics Service (SAME) regarding the number of hospitalized patients with a diagnostic hypothesis of CKIKV in the period, with the study population consisting of 52 confirmed cases of *chikungunya* who were hospitalized in an infectious diseases referral hospital in the period from 2015 to 2018.

A total of 52 medical records that met the following inclusion criteria were included in the study:

a) Neonate patients, children and adults who were hospitalized at Hospital São José;
b) Hospitalization period from January 1, 2015 to December 31, 2018;
c) Laboratory-confirmed cases through IgM serology for CHIKV.

A total of 29 medical records were excluded from the study. There were 4 exclusion criteria:

a) Medical records not located
b) Serology with inconclusive results;
c) Poorly completed medical records with insufficient or illegible information.

Initially, a survey was carried out at the Medical Archive and Statistics Service (SAME) regarding the number of patients hospitalized with CKIKV in the year 2015 to 2018. Subsequently, the medical records were consulted, and the pertinent information that was not included in them was searched in the Notifiable Diseases Information System (SINAN) and in the Central Public Health Laboratory (*LACEN*). The medical records that were not located were manually requested from the SAME, and two search attempts were defined.

The information was collected during the months of August and September 2018 through a form validated by the Notifiable Diseases Information System (SINAN) - Dengue and *Chikungunya* Fever. The variables that were used were: sociodemographic: name, age, race/color, sex, education, municipality of residence; clinical-epidemiological data: clinical signs, pre-existing diseases, serology; Laboratory data: date of admission, confirmation/discard criteria, clinical presentation, and case evolution.

As this is a descriptive statistic, the results were analyzed in absolute numbers and percentages, and presented in the form of tables and figures.

The research was carried out in accordance with the principles of Resolution 466/2012 of the National Health Council (CNS), ensuring the confidentiality of information, as well as other aspects. Ethical precepts were present in all stages of the study, as is recommended for research involving

human beings. The authorization for the handling of the data and the beginning of the collection occurred after the agreement of the term of consent and the faithful depositary.

The research project was approved by the Research Ethics Committee (REC) of the São José Hospital for Infectious Diseases with CAAE:96237218500005044.

4 RESULTS AND DISCUSSION

In the present study, it was possible to find the profile of 52 hospitalized patients; The clinical and epidemiological characterization in more detail is presented in the following tables:

Table 1 - Distribution of socioeconomic data of patients with Chikungunya *Fortaleza CE, 2015-2018.*

CHARACTERISTICS	N	%
GENDER		
Male	23	44,2
Female	29	55,8
AGE GROUP		
0 to 10 years	27	51,9
11 to 19 years old	7	13,5
20 to 29 years old	1	1,9
30 to 39 years old	3	5,8
40 to 50 years old	2	3,8
51 to 60 years old	1	1,9
Over 60 years old	11	21,1
SCHOOLING		
Illiterate	1	1,9
Complete Elementary School	2	3,9
Incomplete Elementary School	4	7,7
Complete High School	3	5,8
Incomplete High School	1	1,9
Nothing is on record	14	26,9
Not applicable	27	51,9
RACE		
Brown	24	46,2
Black	01	1,9
Nothing is on record	27	51,9
MUNICIPALITY OF RESIDENCE		
Fortress	30	57,7
Metropolitan Region	12	23,1
Interior	10	19,2

Source: Survey data, 2020

The profile of the hospitalized patients who participated in the study shows that 29 cases (55.8%) were female and 23 (44.2%) were male. Regarding the most frequent age group, 51% of the cases, 27 people, were aged between 0 and 10 years, and 21.1% of the cases, 11 people, were over 60 years old (Table 1).

In a study published at the São José Hospital for Infectious Diseases, by Beserra *et al*. (2019), with 14 children hospitalized with positive IgM serology for CHIKV, there was no gender prevalence. Another study conducted in Ceará by Pinto *et al*. (2019), which included 3,080 patients, found a higher prevalence of female hospitalized patients.

The predominance of cases in females and the age group of children and the elderly can be discussed by the greater exposure to the vector due to the fact that they spend a longer period at rest inside their homes, exposing themselves more to mosquitoes during the vector's activity times than men of productive age, who generally spend most of the day moving outside their homes (QUEIROZ *et al.,* 2021).

Regarding schooling, we can observe that, of the 52 patients, 27 (51.9%) did not apply because they had not yet started their studies, 14 (26.9%) did not have records of schooling in the medical records researched, and 4 (7.7%) had incomplete elementary school (Table 1). According to Guzman *et al.*, in 2016, 34.4% had incomplete primary education.

Regarding race, 24 cases (46.2%) were brown and 1 (1.9%) was black. It was observed that most cases (51%) did not have records in the medical records studied. Regarding the municipality of residence, 30 cases (57%) lived in Fortaleza and 12 cases (23%) in the metropolitan region (Table 1).

The disorderly growth of cities, together with climate change, provides artificial oviposition sites for the proliferation and dissemination of mosquitoes, especially *Ae. Aegypti* (LIMA-CAMARA, 2016).

Table 2 - Signs and symptoms, underlying diseases, hospitalization criteria, length of hospital stay, and evolution of patients with *Chikungunya* Fortaleza, CE, 2015-2018.

CHARACTERISTICS	N	%
Symptomatology*		
Fever	51	98,0
Exantema	32	61,5
Intense arthralgia	32	61,5
Myalgia	18	34,6
Headache	06	11,5
Retroorbital pain	06	11,5
Arthritis	02	3,8
Conjunctivitis	01	1,9
Pre-existing conditions*		
Absence of Comorbidities	41	78.85
Systemic Arterial Hypertension	05	9,6
Diabetes	04	7,7
Hepatopathies	01	1,9
Hematologic Diseases	01	1,9
Hospitalization criteria*		
Neurological involvement	18	34,61
Vesicobocular rash	09	17,3
Persistent vomiting	07	13,5
Newborns	07	13,5
Decompensation of underlying disease	07	13,5
Mucous membrane bleeding	06	11,5
Signs of shock	02	3,8
Dyspnea	01	1,9
Length of hospital stay		
1 to 10 days	45	86
11 to 20 days	02	04
Above 30 days	05	10

Evolution/Outcome	N	%
Discharge	49	94
Death	02	04
Transfers	01	02

*The above symptoms and criteria may be repeated.
Source: Survey data, 2020

It can be observed that the most frequent symptoms presented were 51 cases (98.0%) with fever, followed by 32 cases of rash and arthralgia (61.5%) (Table 2). Ribeiro *et al.* (2019), in their study, evidenced the prevalence of fever in cases of dengue and *chikungunya*, corroborating our study. *Chikungunya* virus infection produces a sudden-onset, debilitating febrile state

In a study conducted in the same hospital with children, of the 14 children hospitalized for CHIKV with positive IgM serology, 13 had rashes (92.8%); among these, 8 (57.1%) had rashes with characteristics of vesicobullous rash (BESERRA *et al.,* 2019).

In another study conducted in the municipality of Mossoró, arthralgia was the most frequent symptom (81.9%), followed by fever (68.81%) and myalgia (47.69%) (QUEIROZ *et al.,* 2021).

We also observed that, among the 52 patients, 41 (78.85%) of them did not have comorbidities and 11 patients had pre-existing diseases, of which 5 cases (9.6%) were systemic arterial hypertension and 4 cases (7.7%) had diabetes (Table 2).

Simião *et al.* (2019), in a similar study, found the most frequent symptoms in their study: fever (90.8%), headache (76.1%), arthralgia (75.6%) and myalgia (66.7%). Among those who reported baseline diseases, systemic arterial hypertension (SAH) (59%) and diabetes mellitus (DM2) (25%) predominated.

Pinto *et al.* (2019), in their study, found a high prevalence of hypertension and DM2 in the patients studied, in such a way that DM2 was the second most common comorbidity after hypertension and was associated with increased length of hospital stay in patients with comorbidities.

Regarding the criteria for hospitalization, neurological involvement stands out with 18 cases (34.6%) and vesicobullous rash with 9 cases (17.3%). Of the hospitalized patients, 45 (86%) remained for an average of 10 days and 5 (10%) for more than 30 days. Regarding clinical evolution/outcome, 49 people (94%) were discharged from hospital.

In this study, the main criterion for hospitalization was neurological involvement, described in 18 (34.61%) patients. According to Lima *et al.*(2020), neurological complications account for up to 25% of atypical cases and up to 60% of severe atypical cases of CHIKV infection with a high proportion of deaths, as reported by several other authors, thus suggesting that these complications may be more severe than previously recognized. Cases of *chikungunya* stood out with high morbidity, mortality, and incidence of severe diseases, including encephalitis and meningoencephalitis.

A myriad of clinical neurological syndromes related to CHIKV have been described in the literature: encephalitis, meningitis, meningoencephalitis, myelitis, Guillain-Barré syndrome, acute

disseminated encephalomyelitis (ADEM), optic neuritis, etc. (META *et al.*, 2018). In Ceará, there are numerous case series of *chikungunya* and neurological complications, with emphasis on encephalomyelitis and meningitis I (FERREIRA *et al.,* 2020).

5 CONCLUSION

The objective of this study was to describe the clinical and epidemiological profile of patients affected by *chikungunya*. Of the hospitalized patients, a higher prevalence was characterized in female children in the preschool phase, brown and living in urban areas. From the hospitalization criteria, a large number of patients with neurological involvement were evidenced and who were discharged.

We reinforce the need for further studies of greater scope in order to contribute to the construction of knowledge about the role of CHIKV in the region, as well as the need for investigations of epidemiological data, reflecting in the assistance for the elaboration and establishment of plans and strategies for control, prevention and health care by management agencies that assisted the multidisciplinary team in its strategies in the care of this clientele

As a limitation of the study, the inconsistency of information in the medical records emerged, an expected difficulty in the face of secondary data, but it requires interventions, as it mainly hinders the effectiveness of public policies.

We suggest the inclusion of neurological screening and timely recognition of severe cases with complications and, consequently, the possibility of interfering with the determinants to contain the occurrence of deaths.

According to Meta *et al.* (2018), in endemic areas, *chikungunya* virus should be tested in all patients presenting with acute neurological disease and all mothers presenting with fever, arthralgia, or rash; neonates with suspected infection should be followed for at least 2 years for evidence of neurodevelopmental delay, regardless of initial presentation.

REFERENCES

BESERRA, F.L.C.N. *et al.* Clinical and laboratory profiles of children with severe BESERRA, F.L.C.N. *et al.* Clinical and laboratory profiles of children with severe chikungunya infection. Revista da Sociedade Brasileira de Medicina Tropical, v. 52, n. p. 1-4, nov. 2019. Disponível em: https://pubmed.ncbi.nlm.nih.gov/30994798/ Acesso: 20 ago. 2021.

BRASIL. Ministério da Saúde, Secretaria de Vigilância em Saúde. Monitoramento dos casos de dengue, febre de *chikungunya* e febre pelo vírus Zika até a Semana Epidemiológica, Boletim Epidemiológico. v. 48, n. 5, p. 3-4, 2017a. Disponível em: https://www.gov.br/saude/pt-br/coronavirus/boletins-epidemiologicos. Acesso: 20 ago. 2021.

BRASIL. Ministério da Saúde, Secretaria de Vigilância em Saúde, Secretaria de Atenção Básica. *Chikungunya*: Manejo Clínico. 2. ed. Brasília: Ministério da Saúde, 2017b.

BRASIL. Ministério da Saúde, Secretaria de Vigilância em Saúde. Monitoramento dos casos de arboviroses até a semana epidemiológica 22 de 2022. Boletim Epidemiológico. v. 53, n. 14, p. 3, jun-2022. Disponível em: https://www.gov.br/saude/pt-br/centrais-de conteudo/publicacoes/boletins/boletins-epidemiologicos/edicoes/2022. Acesso: 23 jun. 2022.

BRASIL. Ministério da Saúde, Secretaria de Vigilância em Saúde. Monitoramento dos casos de arboviroses urbanas transmitidas pelo Aedes Aegypti (dengue chikungunya e zika). Semanas Epidemiológicas, Boletim Epidemiológico. v. 51, n. 14, p. 1-7, 2020. Disponível em: https://www.gov.br/saude/pt-br/coronavirus/boletins-epidemiologicos. Acesso: 20 ago. 2021.

BRITO, A. A. C. *et al*. *Pharmacologic management of pain in patients with Chikungunya: a guideline*. Revista da Sociedade Brasileira de Medicina Tropical, v. 49, n. 6, Nov/Dez, 2016. Disponível em: https://www.scielo.br/j/rsbmt/a/YGchR5TMVyD8zncfHGzYCtw/. Acesso: 3 set. 2021.

CEARÁ. Secretaria da Saúde do Estado do Ceará, Núcleo de Vigilância Epidemiológica. Boletim Epidemiológico. Dengue, *Chikungunya* e Zica, p. 2/13, junho, 2017. Disponível em: https://www.saude.ce.gov.br/download/boletins/. Acesso em: 10 set. 2021.

CEARÁ. Secretaria da Saúde do Estado do Ceará. Boletim Epidemiológico. Arboviroses Urbanas. Semana Epidemiológica 02/2022. nº 01. Disponível em: https://www.saude.ce.gov.br/download/boletins/. Acesso em: 10 mar. 2022.

CHRUSRI, S. *et al. Short Report: Case Reports of Neuro-Chikungunya in Southern Thailand*. *Am. J. Trop. Med. Hyg*., 85(2), 386–389, 2011. Disponível em: https://www.ajtmh.org/view/journals/tpmd/85/2/article-p386.xml. Acesso em: 10 abr. 2020.

COSTA, M.F.L.; BARRETO, S.M. Tipos de estudos epidemiológicos: conceitos básicos e aplicações na área do envelhecimento. Epidemiologia e Serviços de Saúde, Brasília, v. 12, n. 4, p. 189-201, out./dez. 2003. Disponível em: http://scielo.iec.gov.br/scielo.php?script=sci_arttext&pid=S167949742003000400003&lng=pt&nrm=iso>. Acesso em: 09 mar. 2022.
2016).

FERREIRA, M.L.B.F *et al.* Neurological disease in adults with Zika and chikungunya virus infection in Northeast Brazil: a prospective observational study, v.19,p.826-838,nov.2020

Disponível em: https://pubmed.ncbi.nlm.nih.gov/32949543/ Acesso em: 10 abr. 2020.

GUZMAN, M.G. *et al*. Dengue infection. *Nat Rev Dis Primers*. v. 18, ago, 2016. Disponível em: https://pubmed.ncbi.nlm.nih.gov/27534439/. Acesso em: 10 abr. 2020.

HSJ. Fortaleza: 2021. Disponível em: http://www.hsj.ce.gov.br. Acesso em: 17 mar. 2022.

LIMA, E.C.B. *et al.* Análise de sobrevivência em doenças neurológicas não congênitas relacionadas a infecções por dengue, *chikungunya* e zika vírus em Nordeste do Brasil. Rev Inst Med Trop. São Paulo, v. 62, n. 69, p. 1-9, 2020. Disponível em:https://www.scielo.br/j/rimtsp/i/2020.v62/ Acesso em: 10 abr. 2021.

LIMA-CAMARA, T. N. Emerging arboviruses and public health challenges in Brazil. Revista de saúde pública, v. 50, p. 1–7, 2016. Disponível em: https://www.scielo.br/j/rsp/a/ZVNSNvmVknYpnDYnNYZHwxk/ Acesso em: 10 abr. 2020.

MADARIAGA, M.; TICONA, E.; RESURRECION, C. Chikungunya: Bending over the Americas and the rest of the world. Braz J Infect Dis,v.20, n.1, p.92-98,2016.Disponível : https://www.scielo.br/j/bjid/a/hy6BhX6TxKP65DGVncST99j/?format=pdf&lang=en/ Acesso em 20 jun.2022.

META, R *et al.* As complicações neurológicas do vírus *chikungunya*: uma revisão sistemática. Rev Med Virol. n 28, p. 4-24, 2018. Disponível em: https://www.ncbi.nlm.nih.gov/search/journals/9112448/. Acesso em: 10 abr. 2020.

PINTO JR, S. J. *et al*. Clinical profile and factors associated with hospitalization during a Chikungunya epidemic in Ceará, Brazil. Rev Soc Bras Med Trop, v.52,p-1-6,2019. Disponível em: https://www.scielo.br/j/rsbmt/a/83gxp9rr4xpjN4nQpwDX3Tz/?format=pdf. Acesso em: 20 ago. 2021.

QUEIROZ, T. A. *et al.* Aspectos epidemiológicos e clínicos da febre *chikungunya* em um município do semiárido brasileiro. Rev Brazilian Journal of Development, v.7, n.7, Jul, 2021. Disponível em: https://www.researchgate.net/publication/353157726_Aspectos_epidemiologicos_e_clinicos_da_febre_chikungunya_em_um_municipio_do_semiarido_brasileiro_Epidemiological_and_clinical_aspects_of_chikungunya_fever_in_a_municipality_in_the_Brazilian_semiarid_r Acesso em: 10 mar 2022.

REYES, J.A.; LECHUGA, E. N.; GARCES, J.C.N. *Enfermedad por el virus del Chikungunya: historia y epidemiología*. *Salud* Uninorte. Barranquilla. v.31, n.3, p.621-630, 2015. Disponível em: https://pesquisa.bvsalud.org/portal/resource/pt/lil-791395. Acesso em: 20 ago. 2020.

RIBEIRO, T. M. *et al*. As arboviroses do município de Campos dos Goytacazes/RJ: do município ao paciente. Perspectivas Online: Biológicas & Saúde, v. 9, n. 31, p. 22-33, 2019. Disponível em: https://ojs3.perspectivasonline.com.br/. Acesso em: 20 ago. 2021

ROSSO, F. *et al*. Co-infección por virus del dengue (DEN-V) y virus Chikungunya (CHIK-V) durante un brote epidêmico en Cali, Colômbia. Comunicación de un caso fatal. Rev Chilena Infectol. v.33, n.4, p.464-467, 2016. Disponível em: https://www.researchgate.net/publication/310471369_Coinfeccion_por_virus_del_dengue_ENV_y_virus_Chikungunya_CHIKV_durante_un_brote_epidemico_en_Cali_Colombia_Comunicacion_de_un_caso_fatal. Acesso em: 20 ago. 2020.

SÃO PAULO, Secretaria do Estado de São Paulo, Coordenadoria de Controle de Doenças. Protocolo de Manejo Clínico de Chikungunya no Estado de São Paulo. 2021. Disponível em: https://www.saude.sp.gov.br/resources/ccd/homepage/protocolo-chikungunya/protocolo_chikungunya.pdf. Acesso em: 10 mar 2022.

SILVA M.N. *et al.* Vigilância de chikungunya no Brasil: desafios no contexto da Saúde Pública. Rev Epidemiol. Serv. Saude, v.27, n.3,2018. Disponível em: http://scielo.iec.gov.br/scielo.php?script=sci_abstract&pid=S1679-49742018000300006&lng=pt&nrm=iso?iframe=true Acesso em: 20 ago. 2020.

SIMIÃO, A. R. et al. A major chikungunya epidemic with high mortality in northeastern Brazil. Revista da Sociedade Brasileira de Medicina Tropical, . v. 52. 2019.Disponível em:https://www.scielo.br/j/rsbmt/a/HK3MkR57y63cmjyq5Xsz5Rb/?format=pdf&lang=en.Acesso em :28 jun.2022.

SEVEN publicações acadêmicas

Dentin hypersensitivity and laser therapy

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ABSTRACT
Dentin hypersensitivity is considered an acute pain of short duration, resulting from the exposure of open dentinal tubules to the oral environment in response to mechanical, thermal, chemical and osmotic stimuli. Among the various treatments available, hypersensitivity can be treated with specific dentifrices, fluoride, desensitizers, adhesive systems and also through laser therapy. Laser therapy has been increasingly used for therapeutic purposes in dentistry, with properties such as photobiostimulation, photobiomodulation, analgesia and anti-inflammatory action. The objective of this work was to demonstrate, through a literature review, the scientific basis and clinical studies that support the use of lasers for the treatment of cervical dentin hypersensitivity. For its elaboration, articles were selected in the databases: PubMed, Virtual Health Library (Medline/LILACS/BBO), Science Direct, applying the following search descriptors in Portuguese "hypersensitivity", "lasertherapy", "dentinal tubules", " pain", "non-carious cervical lesions", in English "Dentin hypersensitivity", "Non-carious cervical lesion" and "laser". Based on the reading of titles and abstracts, and considering the following inclusion criteria: literature review articles, systematic review, randomized clinical trials and laboratory studies reporting on the use of laser published in the period from 2015 to 2021. The excluded works were unavailable articles in full, monographs, studies with incomplete methodology, dissertation and thesis.

Keywords: Hypersensitivity, Lasertherapy, Dentinal tubules, Pain, Non-carious cervical lesions.

1 INTRODUCTION

Dentin hypersensitivity (DH) is one of the most common complaints of patients in dental clinics, it is usually described as a short-lived non-spontaneous acute pain resulting from the exposure of open dentin tubules to the oral environment in response to mechanical, thermal, chemical and osmotic stimuli. [1,2,3]

The buccal surface of the teeth is most commonly involved in patients with dentin hypersensitivity and occurs most frequently in the maxillary canines and premolars, followed by incisors and molars. HD is defined as a pathological process of multifactorial etiology and can occur as a consequence of a process of caries, abrasion, erosion, abfraction, traumatic toothbrushing and periodontal disease, resulting in loss of tooth structure in the cervical region.[4.5]

Zeola et al. (2019) in a systematic review and meta-analysis concluded that the prevalence of HD is between 11 and 33%, being considered a pathology of painful symptomatology with lower treatment success rates.[6]

Several theories seek to explain the mechanism by which a stimulus is transmitted from the dentin to the pulp, however, the most widely accepted theory is that of hydrodynamics, which was proposed in 1964 by Brännström, in which he proposes that the dentinal tubules are filled with fluids, and when exposed to external stimuli, they can be; physical, chemical, osmotic, pressure or temperature; They induce the movement of this fluid, promoting the contraction or distension of the extensions of odontoblasts, activating the nerve endings located near the dentin-pulp, generating pain throughout the tubules.[1,4,7]

Thus, it is necessary to make a correct diagnosis, identifying the etiological factors involved, understanding the multifactoriness of HD and its risk factors, which include traumatic toothbrushing, gingival recession due to periodontal therapy, parafunctional habits, individual behaviors and diet, for the elaboration of a personalized planning, aiming to manage the etiological factors for a correct intervention and prevention of future damages.[6.7]

The treatment of dentin hypersensitivity should aim to define the causal factors before the methods for controlling and treating the disease are selected. The painful symptomatology of dentin hypersensitivity may regress without treatment, by remineralization by saliva or by the formation of reactive dentin, and dentin permeability may decrease spontaneously.[1,6,7]

Treatment can be based on dentin desensitization, with the use of fluoride (toothpastes), gingival covering, dental adhesives (restoration), endodontic treatment using laser therapy, with low-level laser (LBI) and high-intensity laser (LAI).[1.7]

In cases of loss of less than 1 mm of tooth structure, desensitization is indicated. Desensitization also occurs by natural processes such as reparative dentin, sclerotic dentin, and dental calculus formation on the dentin surface.[8]

Desensitizing agents can act with neural or obliterating action. The neural mechanism acts in the desensitization of nerve fibers, with potassium being the only chemical desensitizing agent of neural action, which acts by promoting an increase in the concentration of potassium ion in the odontoblastic endings, reducing the ability to conduct the sensory stimulus of the nerve fibers that would promote pain.[6.8]

Laser is widely used in numerous therapies in dentistry, as a healing agent for ulcers, mucosal lesions, dental surgeries, and pain management.[2,9,10]

For the treatment of dentin hypersensitivity, one can use both LAI, which acts by promoting dentin sealing by obliteration of dentin tubules, and LBIs, which act through analgesic, anti-inflammatory and biostimulatory effects of the dental pulp, leading to the formation of reactive dentin.[2.10]

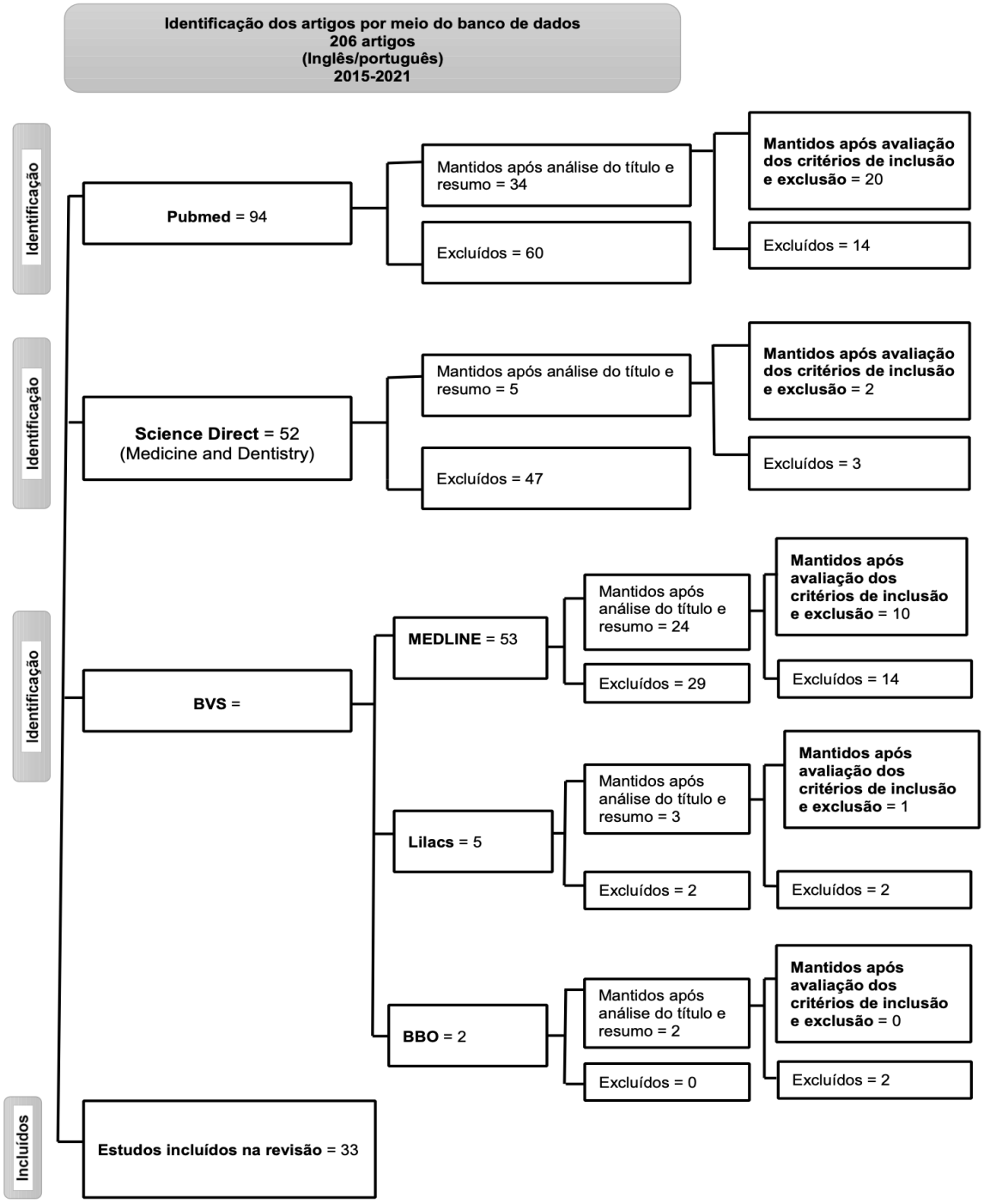
LBIs have been increasingly used in dentistry, considered physical agents of neural action that act on nerve endings, increasing the patient's pain threshold.[7,9,10]

2 OBJECTIVE

To demonstrate, through a literature review, the scientific basis and clinical studies that support the use of lasers for the treatment of cervical dentin hypersensitivity.

3 METHODOLOGY

Figura 1: Fluxograma da busca e seleção dos estudos



Fonte: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n 71. Adaptado

4 LITERATURE REVIEW

Dentin hypersensitivity has a high prevalence in the adult population, affecting one in six patients, and is described as a short-lived non-spontaneous acute pain resulting from the loss of the protective material, tooth enamel, and exposure of the dentin tubules, promoting excessive sensitivity in the dentin in response to non-noxious stimuli, typically thermal, evaporative, tactile, osmotic or chemical, and which cannot be attributed to any other form of dental defects or disease.[2,11,12]

The incidence of HD peaks at 30-40 years, and female patients have the highest incidence of this pathology, and the most affected teeth are the canines and premolars, followed by the incisors and molars, and usually involves the buccal surfaces in the cervical region of the teeth.[3]

Pain is a sensory and emotional experience of discomfort, presenting a subjective and individual character, and dentin hypersensitivity affects the quality of life of patients and can lead to dietary and social limitations and psychological impact.[13] The affected teeth become sensitive to stimuli, the patient feels pain in daily activities such as eating, drinking, talking and brushing teeth.[13.14]

Pain results from the activation of specialized sensory receptors, the primary afferent nociceptors that are present in myelinated A-δ nerve fibers that correspond to mechanical and thermal stimuli (rapidly felt pain, pinpricking sensation, stinging).[13.14]

The A-δ fibers are activated by means of the hydrodynamic mechanism, represented by the flow of fluids inside the dentin tubules caused by external stimuli, histologically, the hypersensitive dentin has enlarged dentin tubules and in greater number per area, compared to the dentin absent of sensitivity, the dentin tubules when exposed, are vulnerable to cold, substances acidic or sweet, or just by the mechanical touch.[14th]

4.1 PAIN ASSESSMENT

In order to measure pain intensity, scales were developed to measure the variability of responses (verbal and non-verbal) to pain. The subjective pain scales aim to measure, qualify or evaluate the individual's behavior in the face of the painful experience. Among the subjective pain scales, the most used is the Visual Analogue Scale (VAS), considered the gold standard, with the advantage of reliability, simplicity, ease of use and versatility. [4,6,15]

The VAS scale is a one-dimensional instrument for the assessment of pain intensity, it consists of a horizontal line of 10 centimeters with the ends numbered from 0-10, at one end of the line is marked "no pain" and at the other "unbearable pain".[15.16]

To assess the intensity of the pain, the dentist should ask the patient to evaluate and mark on the line the pain present at the time of the consultation. The categorization of pain depends on the amplitude of the scale, on a scale of 0 to 10 points the criterion usually used is:

· 0-1 no pain; 1-3 mild pain; 3-7 moderate pain; 7-10 severe pain.

· 0-1 no pain; 1-3 mild pain; 3-6 moderate pain; 6-9 severe pain; 9-10; very pain.

The Schiff sensitivity scale is also used to assess the painful sensation of HD in the face of stimuli.[6] The Schiff scale has four levels of response to stimuli: (0) subject does not respond to air stimuli; (1) the subject responds to the air stimulus but does not require discontinuation of the stimulus; (2) subject responds to the air stimulus and requires discontinuation or flees from the stimulus; (3) subject responds to the stimulus, finds it painful, and requires discontinuation of the stimulus immediately.[6.15]

4.2 DIAGNOSIS

Accurately diagnosing HD is critical to determining an appropriate and effective treatment, and the primary goal of diagnosis is to identify and control etiologic factors. [4.17]

The initial diagnosis of dentin hypersensitivity is made through the patient's perception of the pain caused when the sensitized tooth is exposed to hot and cold stimuli, brushing, flossing, and chewing. [1.6]

The steps to conclude an accurate diagnosis include: thorough and detailed anamnesis followed by extraoral and intraoral clinical examination; complete periodontal examination; occlusal analysis, signs of parafunction, articulator mounting; analysis of salivary profile and parameters; analysis of eating habits; analysis of oral hygiene habits, and radiographic examinations.[17.18]

In order to conclude the diagnosis, in addition to the HD test and complementary tests, it is essential to induce the characteristic transient acute pain by applying a stimulus to the affected tooth to mimic the patient's complaint or symptom.[17.18]

It is important that the dentist knows how to make a differential diagnosis, as there are other clinical situations thathave the same characteristics as dentin hypersensitivity. To do this, the professional must evaluate and investigate the patient's clinical history, compare teeth with and without symptoms, seeking to eliminate possible causes of pain.[2] Some conditions that may present with symptoms similar to HD are coronary fractures, defective or fractured restorations, enamel invaginations, occlusal trauma, dental preparation for restorations or restoration-induced pulp hyperemia, teeth whitening, cervical plaque, gingivitis, periodontal disease, and pulp pathologies.[19th]

Persistent, non-transient dental pain, different from that presented with HD, is usually a sign of inflammation in the dental pulp or periodontal tissues, as well as possible infection associated with a pathological condition, such as caries, traumatic tooth fracture, pulp exposure, pulp sclerosis, periodontal disease.[13.20 am]

HD has a multifactorial etiology that corresponds to a triad of factors related to dentin hypersensitivity, gingival recession and non-carious cervical lesions. The factors that modulate the formation and evolution of dentin hypersensitivity are abrasion, attrition, erosion and abfraction.[21]

Abrasion is the mechanical wear of the tooth structure due to the repeated friction of a foreign body (external factors), with inadequate brushing being one of the main causes. Erosion, on the other hand, is the superficial and substantial loss of hard dental tissues caused by chemical processes, not bacteriological.[21]

- Dental attrition: corresponds to mechanical wear that affects the incisal and occlusal surfaces related to occlusal hyperfunction and/or parafunctional habits such as clenching and bruxism.[21.22]

Abfraction are wedge-like lesions that arise from the presence of occlusal trauma, excessive masticatory force, or tooth clenching, leading to changes in tooth structure.[21.22]

In this sense, several studies have been carried out in recent years5,6,19,20, with the objective of analyzing the most effective treatment to combat dentin hypersensitivity, which can be treated with toothpastes, fluoride applications, desensitizers, restorative adhesive systems, and application of high and low power lasers.[22]

4.3 LASER THERAPY

Among the numerous therapies for HD, laser technology has been researched in the field of health, analyzing the interaction of light with the most diverse tissues, expanding its use as a therapy for dentin pain.[21] Laser can be integrated as an adjunct to conventional treatment therapy or used alone as an alternative mode in some pathologies.[10,14,23]

According to the wavelength of the laser and the dose applied, the application of the laser on dental tissue and adjacent tissues is differentiated, being classified as low power laser (LILT – low intensity laser treatment) or non-surgical, and high power (HILT – High intensity laser treatment) or surgical. [8.9]

High-intensity lasers, such as Nd:YAG, Er:YAG, Er, Cr:YSGG and CO2, are used to obliterate the embouchure of dentin tubules, act on dentin through phothermal effects by heating and melting the hydroxyapatite crystals of the dentin. When the dentin cools, it recrystallizes promoting the sealing of the dentin tubules.[3,9,14]

Low-level lasers such as GaAlAs or He-Ne produce rapid action with analgesic and anti-inflammatory effects through a photochemical process. Low-level laser photobiomodulation therapy acts at the molecular level, its neural mechanism of action promotes the change of the electrical potential of the cell membrane, activating the Na+ and K+ pumps, promoting an increase in the synthesis of adenosine triphosphate (ATP), the release of endorphins and the blocking of the depolarization of afferent C fibers, preventing the transmission of the pain stimulus.[3,9,14]

Lasers can be applied to different media (solid, liquid, or gaseous), resulting in different types of radiation and wavelengths.[4.23]

Due to these different types of wavelengths, which have specific properties, they can generate different interactions of transmission, absorption, dispersion or reflection, and the absorption is most commonly used in dentistry, because what is sought is the absorption of laser light by the target tissue, thus implying the achievement of the intended biological effect.[4.23]

There are different parameters that influence the treatment response, which must be observed for the application of the laser, namely: power (W), exposure time (seconds), energy density (J/cm2), energy per point (J), type of emission - pulsed or continuous, and number of irradiated points.[9]

In dentistry, the use of laser has intensified since the 1980s, when the effects of low-level laser in the treatment of patients with dentin hypersensitivity were analyzed.[2]

The use of these low-level lasers provides significant pain relief after application, in addition to the production of tertiary dentin by the odontoblasts, resulting in a decrease in fluid movement in the dentin tubules and dentin permeability.[8,24,25]

The wavelength leads to an increase in the level of excitability of the free nerve endings, thus reducing pain. Currently, the most widely used (non-surgical) lasers are diode lasers, with wavelengths ranging from 600 to 700 nm (visible red range) and 700 to 950 nm (infrared range of the electromagnetic spectrum). [11.4]

Considering that low-power lasers are not based on increasing temperature, it should not exceed 1º Celsius, and the power should not exceed 500 mW, providing a cellular bioregulation action (anti-inflammatory, healing, myorelaxing and analgesic effects).[11]

Table 1 shows the laser therapy protocols found in the literature.

Table 1 – Laser therapy protocol applied to the treatment of Hypersensitivity

Author year	N	Protocol Used	Stimulation	Evaluation/method	Follow-up period
Pantuzzo, 2020	28 (10)	GaAlAs Laser, Diode (810–830 nm, power 0.5–4.5 W), for 60s.	Probe & Air Jet	EVA	After 15min, 7 days.
Maximiano, 2018	70 (143/ 124/127)	Nd:YAG laser (1 W, 10 Hz, 85 J/cm2) 4 irradiations for 15 seconds with an interval of 10 seconds. Irradiation (performed twice in the mesial-distal and occlusion-gingival directions.	Probe & Air Jet	EVA	After 5 min, 1 week and 4 weeks
Chebel, 2018	78 (39/39)	Laser Nd:YAG (60 mJ, 2 Hz, 0.64 W, 35.8 J/cm2, 4 repetitions for 20 s). Distance from exposed surfaces, 6mm.	Probe & Air Jet	EVA	1week,1,3,6 months
Osmari, 2018	76 (19/19/19/19)	Diode Laser (810–830 nm, power 0.5–4.5 W)	Air Jet	EVA	Immediate, 15, 30 and 60 days.

Ozlem, 2018	17 (100)	Nd:YAG ((1 W, 10 Hz 100 mJ pulse energy (35.8 J/cm2) inmesiodistal direction for 20 s to each tooth for three times. 10s Interval	Air Jet	EVA	30 min, after 7, 90 and 180 days
Lopes, 2017	G2 (117) n=13	Laser Photon Lase (DMC) 3 points irradiation in the buccal portion and 1 apical 30mW, 10 J/cm2.9 s by 810 nm, with threesessions with an interval of 72 h.	Probe & Air Jet	EVA	5 min (post 1), 12 months (post 2) and 18 months (post 3)
Lopes, 2017	G3 (117) n=13	Laser Photon Lase (DMC) power of 100 mW, 40 J/cm2, and 11 s at each point (dose of 1.1 J per point) three sessions with an interval of 72 h.	Probe & Air Jet	EVA	5 min (post 1), 12 months (post 2) and 18 months (post 3)
Lopes, 2017	G6 (117) n=13	Laser Nd: YAG 120 µ s, 100 mJ, 85 J/cm2, in contact, 1 W power and 10 Hz repetition rate. 4x 15s/ 10s interval	Probe & Air Jet	EVA	5 min (post 1), 12 months (post 2) and 18 months (post 3)
Lopes, 2017	G8 (117) n=13	LPLD + Nd:YAG laser/parameters described in groups G2 and G6, 3 sessions.	Air Jet	EVA	5 min (post 1), 12 months (post 2) and 18 months (post 3)
Pandey, 2017	45 (15)	Picassa Diode Laser (810–830 nm, power 0.5–4.5 W), 60s.	Probe & Air Jet	EVA	1,2 and 3 weeks.
Suri, 2016	60 (30/30)	Laser GaAIAs (980nm, 2W power, 2x 20s)	Probe & Air Jet	EVA	24 hours, 1 week, 1 and 2 months.

Source: Prepared by the authors

5 DISCUSSION

Dentin hypersensitivity is one of the most common painful clinical conditions reported by patients in the clinical routine of dental offices, with multifactorial etiology. It is characterized by acute pain associated with great discomfort and with a negative impact on the quality of life of the affected individual.[1,6,19]

Despite being a widely studied topic, HD continues to be a complaint with prevalence ranging from 3% to 98% in the adult population for different samples.[6] This discrepancy is due to some differences, such as study design, inclusion and exclusion criteria, diagnostic approach, as well as participants' habits and diet.[14.30 am]

Low-level laser treatment in patients with dentin hypersensitivity has been widely used by dentists due to its efficacy, ease of application, relatively low cost, and painless to the patient.[28th]

Laser therapy has an immediate effect on the relief of pain sensitivity, photo-biomodulation in the dental pulp, promoting a delayed effect, which corresponds to the obliteration of the dentin tubules resulting from the increase in the cellular metabolic activity of the odontoblasts, which intensifies the production of tertiary dentin, leading to the reduction of dentin permeability and fluid movement within the dentin tubules, promoting analgesia for the patient.[2]

Sgreccia et al.[30] (2020) evaluated in their randomized clinical trial the efficacy of potassium oxalate gel (Oxa-Gel BF) and GaAIAs (gallium and aluminum) laser in the treatment of HD in 74 patients (389 NCCL) and concludedthat after four applications of low-level laser (GaAlAs) with the 100 mW laser programming protocol, with a wavelength of 808 nm, and standardized energy at 60 J/cm2, the laser was able to eliminate patient discomfort in 52.0% in the tactile stimulus test and 74.7% in the evaporative stimulus test.[30th]

Pantuzzo et al.[14] (2020) conducted a study with 28 individuals and demonstrated efficacy in reducing dentin hypersensitivity by 36% in laser treatment when compared to fluoride treatment, which was 9.5%, after 15 minutes of exposure. And after 7 days, the diode laser treatment was also more effective, with a 37.5% reduction in HD, while the fluoride treatment led to a 31.6% reduction.[14th]

Maximiano et al.[26] (2019) conducted a randomized, double-blind, placebo-controlled clinical trial in which they evaluated the efficacy of the immediate and long-term effects (1 and 4 weeks, respectively) of the Nd:YAG laser and a paste-containing sodium calcium phosphosilicate in the treatment of dentin hypersensitivity in 70 patients. In their study, 23 patients were allocated to the placebo control group (16 with "severe" pain and 7 with "moderate" pain), in group 2 the prophylactic paste of sodium and calcium phosphosilicate (15% CSF) was used in 23 patients (17 with "severe" pain and 6 with "moderate" pain)) and group 3 was used a high-power Nd:YAG laser (1064nm) in 24 patients (17 with "severe" pain and 7 with "moderate" pain). [26th]

The results showed that both the Nd:YAG laser and the prophylactic paste with 15% FCS used in dentin desensitization were efficient in reducing the pain level of the volunteers, both immediately and in 4 weeks.[26th]

Similar results were observed by Chebel et al.[25] (2018) when evaluating the efficacy of Nd:YAG laser compared to MI varnish, the study involved 54 teeth in 12 patients who had dentin hypersensitivity. A split-mouth design was used, the 54 teeth were divided into 27 pairs. Twenty-seven teeth received treatment with Nd:YAG laser, and the 27 contralateral teeth received application of MI varnish composed of 5% sodium fluoride, casein, phosphopeptide, amorphous calcium and phosphate varnish.[25th]

The Schiff sensitivity scale was used to assess pain with air jet stimulation, and the visual analogue scale was used for tactile stimulation tests with the explorer probe and thermal tests.[25th]

The results showed that there was no significant difference between the two treatments, Nd:YAG laser and MI varnish. Both treatments were effective and reduced dentin hypersensitivity immediately and after the 6-month treatment.[25th]

Ozlem et. al.[16] (2018) conducted a study to evaluate the efficiency of a glutaraldehyde-containing agent (Gluma) and Nd:YAG, Er, Cr:YSGG lasers alone and in combination with the desensitizer Gluma in the treatment of dentin hypersensitivity in 17 patients (100 teeth).[16]

The results showed that the reduction in HD was lower in the gluma group than in the Er, Cr:YSGG laser groups, but it was similar in the Nd:YAG laser groups. Er, Cr:YSGG lasers with or without application of the Gluma desensitizer is the most effective modality in the treatment of dentin hypersensitivity.[16]

A randomized longitudinal study conducted by Lopes et al.[28] (2016) compared the different hypersensitivity treatment protocols in 32 patients (117 teeth) for a period of 12 to 18 months. The therapies used included the low-level Photon Lase (DMC) laser, the high-power Nd:YAG laser and the Gluma Desensitizer, a desensitizer based on the HEMA monomer (hydroxyethylmethacrylate) and glutaraldehyde, and finally the association between the laser and the desensitizing agent.[28th]

The level of pain sensitivity of each patient was analyzed by VAS using cold air stimuli and an exploratory probe, before and after the treatments. The authors concluded that after 6 months of evaluation, all treatments performed were efficient in reducing dentin hypersensitivity.[28th]

Lopes et al.[28] (2016) also point out that among high-power lasers, the Nd:YAG laser is considered a gold standard for the treatment of HD because it has been shown to have the ability to obliterate dentin tubules, by fusion and resolidification of the dentin, without pulp lesions or fissures in the irradiated dentin, when used with an appropriate protocol. [28th]

Pandey et al.[2] (2017) in their randomized study compared the efficacy of 5% potassium nitrate (KNO3) toothpaste, low-level laser therapy, and LLLT together with the application of 5% KNO3 toothpaste in the treatment of dentin hypersensitivity. The treatments were performed in weekly sessions, with a total duration of 3 weeks.[2]

The authors concluded that low-level laser alone was more effective in reducing long-term HD pain when compared with 5% potassium nitrate (KNO3). According to this study, there was no additional benefit to using the toothpaste with 5% potassium nitrate along with low-power laser.[2]

According to the authors, the reduction in HD can be attributed to the property of LLLT to act on cellular biostimulation by promoting the increase in mitochondrial ATP production, increasing the threshold of free nerve endings, providing an analgesic effect and stimulating the pulp to produce secondary dentin. Thus, it is expected that the action of the laser will not be immediate, since the formation of this newly formed dentin requires a certain amount of time. This makes the action of the laser gradual and the patient perceives its action in the long term.[2]

Suri et al.[29] (2016), conducted a comparative clinical study that evaluated the efficacy of fluoride varnish, GaAlAs 980 nm diode laser, and the association between laser and fluoride varnish. The study involved 120 teeth in 30 patients with HD assessed by tactile and air jet stimuli measured by the visual analogue scale (VAS). The most effective results were obtained when patients were treated by the association between varnish and high-intensity laser.[29th]

Although clinical studies have shown very favorable results for the use of laser therapy in the treatment of HD, its clinical management has been a challenge for dental professionals, due to the multifactoriness of the disease. Dental surgeons (DC) need to diagnose and act in the control of the cause, it is necessary to have a detailed anamnesis, obtain information on occupational habits, diet diary, gastroesophageal diseases, eating disorders, anxiety-related diseases , temporomandibular disorders and medications of daily use.[2,6,33]

Dentin hypersensitivity has been shown to be extremely related to people's individual habits and lifestyle, excessive and traumatic brushing, poor oral hygiene, gum recession due to periodontal therapy, eating and anxiety disorders, high-stress routine, parafunctional habits.[22.26]

Thus, teeth are exposed to various chemical and physical challenges, leading to an increased prevalence of non-carious cervical lesions and cervical dentin hypersensitivity. For the efficacy of the treatment, the DC must act to control the pain and the evolution of these lesions.[26th]

It is necessary to guide the patient to remove the risk factors, recommend the removal of excess acid in the diet, advise on the correct brushing techniques, educate the patient to control the force of brushing, recommend that brushing be performed 30 minutes after meals, if it is identified that the patient suffers from an anxiety disorder, it should be referred to a professional.[26.33]

6 FINAL THOUGHTS

Laser therapy treatment in patients with dentin hypersensitivity is a promising and effective alternative for pain [control.1,4]

Due to the lack of universally accepted guidelines for differential diagnosis, and the diversity of irradiation methodologies and parameters used in different studies, it is necessary to carry out randomized and controlled clinical investigations to standardize protocols with the use of laser and its correct clinical application in the treatment of dentin hypersensitivity.[2]

The dental surgeon must be able to make an accurate diagnosis, aiming to achieve success in the treatment, for this it is necessary to perform a thorough clinical examination showing whether or not there is the presence of carious lesions, fractured and maladapted restorations, fractured teeth, enamel cracks, lesions that have communication with the pulp chamber, enamel invagination and pulp pathologies, since these conditions are confused due to the similar symptomatology of dental pain.[14,17,19]

Since HD is largely the result of erosive/abrasive tooth wear or dentin exposure related to gingival recession, laser therapy should be coupled with strategies for the management of HD that include oral hygiene education and instruction on brushing techniques, behavioral management, and elimination of predisposing factors.[4]

REFERENCES

Felix J, Ouanounou A. Dentin Hypersensitivity: Etiology, Diagnosis, and Management. Compend Contin Educ Dent. 2019;40(10):653-7; quiz 658.

Pandey R, Koppolu P, Kalakonda B, Lakshmi BV, Mishra A, Reddy PK, et al. Treatment of dentinal hypersensitivity using low-level laser therapy and 5% potassium nitrate: A randomized, controlled, three arm parallel clinical study. Int J Appl Basic Med Res. 2017;7(1):63-6.

Zhou K, Liu Q, Yu X, Zeng X. Laser therapy versus topical desensitising agents in the management of dentine hypersensitivity: A meta-analysis. Oral Dis. 2021;27(3):422-30.

Liu XX, Tenenbaum HC, Wilder RS, Quock R, Hewlett ER, Ren YF. Pathogenesis, diagnosis and management of dentin hypersensitivity: an evidence-based overview for dental practitioners. BMC Oral Health. 2020;20(1):220.

Marto CM, Baptista Paula A, Nunes T, Pimenta M, Abrantes AM, Pires AS, et al. Evaluation of the efficacy of dentin hypersensitivity treatments-A systematic review and follow-up analysis. J Oral Rehabil. 2019;46(10):952-90.

Favaro Zeola L, Soares PV, Cunha-Cruz J. Prevalence of dentin hypersensitivity: Systematic review and meta-analysis. J Dent. 2019;81:1-6.

Teixeira DNR, Zeola LF, Machado AC, Gomes RR, Souza PG, Mendes DC, et al. Relationship between noncarious cervical lesions, cervical dentin hypersensitivity, gingival recession, and associated risk factors: A cross-sectional study. J Dent. 2018;76:93-7.

Soares P. V, Grippo J. O. Lesões Cervicais Não Cariosas e Hipersensibilidade Dentinária Cervical: etiologia, diagnóstico e tratamento. São Paulo: Quintessence Editora, 2017. 224 p.

Oliveira SML, Brito RS, Oliveira LL, Rabelo ZH, Estellita MCA. Use and effectiveness of laser ND: YAG on treatment of hypersensibility dentinary: uma review of literature.Braz. J. of Develop. 2020; 6(4):16872- 890.

Öncü E, Karabekiroğlu S, Ünlü N. Effects of different desensitizers and lasers on dentine tubules: An in-vitro analysis. Microsc Res Tech. 2017;80(7):737-44.

Costa LM, Cury MS, Oliveira MAHM, Nogueira RD, Martins VRG. A Utilização da Laserterapia para o Tratamento da Hipersensibilidade Dentinária: Revisão da Literatura. J Health Sci. 2016;18(3):210-6.

Dantas EM, Amorim FK, Nóbrega FJ, Dantas PM, Vasconcelos RG, Queiroz LM. Clinical Efficacy of Fluoride Varnish and Low-Level Laser Radiation in Treating Dentin Hypersensitivity. Braz Dent J. 2016;27(1):79-82.

Freitas BLS, et al. Scales for pain assessment in cervical dentin hypersensitivity: a comparative study.Cafajeste. Saúde Colet. 2020; 28 (2): 271-277.

Pantuzzo É, Cunha FA, Abreu LG, Esteves Lima RP. Effectiveness of diode laser and fluoride on dentin hypersensitivity treatment: A randomized single-blinded clinical trial. J Indian Soc Periodontol. 2020;24(3):259-63.

Cunha SR, Garófalo SA, Scaramucci T, Zezell DM, Aranha ACC. The association between Nd:YAG laser and desensitizing dentifrices for the treatment of dentin hypersensitivity. Lasers Med Sci. 2017;32(4):873-80.

Ozlem K, Esad GM, Ayse A, Aslihan U. Efficiency of Lasers and a Desensitizer Agent on Dentin Hypersensitivity Treatment: A Clinical Study. Niger J Clin Pract. 2018;21(2):225-30.

Martins CC, Firmino RT, Riva JJ, Ge L, Carrasco-Labra A, Brignardello-Petersen R, et al. Desensitizing Toothpastes for Dentin Hypersensitivity: A Network Meta-analysis. J Dent Res. 2020;99(5):514-22.

Moura GF, Zeola LF, Silva MB, Sousa SC, Guedes FR, Soares PV. Four-Session Protocol Effectiveness in Reducing Cervical Dentin Hypersensitivity: A 24-Week Randomized Clinical Trial. Photobiomodul Photomed Laser Surg. 2019;37(2):117-23.

Bubteina N, Garoushi S. Dentine Hypersensitivity: A Review. Dentistry. 2015: 5: 330.

Moraschini V, da Costa LS, Dos Santos GO. Effectiveness for dentin hypersensitivity treatment of non-carious cervical lesions: a meta-analysis. Clin Oral Investig. 2018 Mar;22(2):617-631. doi: 10.1007/s00784-017-2330-9. Epub 2018 Jan 12. PMID: 29330655.

Miron M, Lungeanu D, Ciora E, Ogodescu E, Todea C. Using Laser-Doppler Flowmetry to Evaluate the Therapeutic Response in Dentin Hypersensitivity. Int J Environ Res Public Health. 2020;17(23).

Regiani BC, Rocha HN, Tognetti VM, de Andrade AP. Hipersensibilidade dentinária em lesões cervicais não cariosas: etiologia e tratamento. ARCHIVES OF HEALTH INVESTIGATION. 2021;10(1):42-8.

Seong J, Newcombe RG, Matheson JR, Weddell L, Edwards M, West NX. A randomised controlled trial investigating efficacy of a novel toothpaste containing calcium silicate and sodium phosphate in dentine hypersensitivity pain reduction compared to a fluoride control toothpaste. J Dent. 2020;98:103320.

Machado AC, Maximiano V, Eduardo CP, Azevedo LH, de Freitas PM, Aranha AC. Associative Protocol for Dentin Hypersensitivity Using Nd:YAG Laser and Desensitizing Agent in Teeth with Molar-Incisor Hypomineralization. Photobiomodul Photomed Laser Surg. 2019;37(4):262-6.

Bou Chebel F, Zogheib CM, Baba NZ, Corbani KA. Clinical Comparative Evaluation of Nd:YAG Laser and a New Varnish Containing Casein Phosphopeptides-Amorphous Calcium Phosphate for the Treatment of Dentin Hypersensitivity: A Prospective Study. J Prosthodont. 2018;27(9):860-7.

Maximiano V, Machado AC, Yoshida ML, Pannuti CM, Scaramucci T, Aranha ACC. Nd:YAG laser and calcium sodium phosphosilicate prophylaxis paste in the treatment of dentin hypersensitivity: a double-blind randomized clinical study. Clin Oral Investig. 2019;23(8):3331-8.

Osmari D, Fraga S, Ferreira ACO, Eduardo CP, Marquezan M, Silveira BLD. In-office Treatments for Dentin Hypersensitivity: A Randomized Split-mouth Clinical Trial. Oral Health Prev Dent. 2018;16(2):125-30.

Lopes AO, de Paula Eduardo C, Aranha ACC. Evaluation of different treatment protocols for dentin hypersensitivity: an 18-month randomized clinical trial. Lasers Med Sci. 2017;32(5):1023-30.

Suri I, Singh P, Shakir QJ, Shetty A, Bapat R, Thakur R. A comparative evaluation to assess the efficacy of 5% sodium fluoride varnish and diode laser and their combined application in the treatment of dentin hypersensitivity. J Indian Soc Periodontol. 2016;20(3):307-14.

Sgreccia PC, Barbosa RES, Damé-Teixeira N, Garcia FCP. Low-power laser and potassium oxalate gel in the treatment of cervical dentin hypersensitivity-a randomized clinical trial. Clin Oral Investig. 2020;24(12):4463-73.

Tabatabaei MH, Chiniforush N, Hashemi G, Valizadeh S. Efficacy Comparison of Nd:YAG laser, diode laser and dentine bonding agent in dentine hypersensitivity reduction: a clinical trial. Laser Ther. 2018;27(4):265-70.

Zhou K, Liu Q, Yu X, Zeng X. Laser therapy versus topical desensitising agents in the management of dentine hypersensitivity: A meta-analysis. Oral Dis. 2021;27(3):422-30.

Douglas-de-Oliveira DW, Vitor GP, Silveira JO, Martins CC, Costa FO, Cota LOM. Efeito do tratamento de hipersensibilidade dentinária na qualidade de vida relacionada à saúde bucal - uma revisão sistemática e meta-análise. J Dent. 2018; 71: 1-8.

SEVEN publicações acadêmicas

Impact of pharmaceutical care on the follow-up of patients with chronic diseases in a primary health care unit in the city of São Luís-MA

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ABSTRACT

In Pharmaceutical Care, pharmacists collect and evaluate information about the patient, including the identification of possible Drug-Related Problems (DRPs), in addition to encouraging self-care and promoting better pharmacotherapy. The objective was to evaluate the impact of pharmaceutical care on the quality of life of a patient with breast cancer and metabolic syndrome. Pharmacotherapeutic follow-up was carried out for one semester. In the meantime, adherence (BaMQ), degree of depression (PHQ-9) and quality of life (SF-36) of the patient were evaluated before, during and after the interventions. Patient undergoing chemotherapy for breast cancer, undergoing treatment for diabetes, hypertension, dyslipidemia, in addition to practicing self-medication. Before follow-up, he presented drastic fluctuations in blood glucose and blood pressure, poor eating habits, dyslipidemia, sedentary lifestyle and complaints of pain. After the interventions, he showed a relative improvement in the metabolic syndrome linked to better life habits, despite the aggressive treatment of chemotherapy. The interventions carried out during the pharmaceutical follow-up had positive impacts, which reinforces the importance of the pharmacist in satisfactory primary care and health promotion.

Keywords: Chronic Noncommunicable Diseases, Pharmaceutical Care, Breast Cancer, Adherence.

1 INTRODUCTION

The proposal of pharmaceutical care is based on the monitoring of the patient's drug treatment through its orientations and is associated with the provision of quality pharmaceutical care, which helps in the prevention and detection of possible negative results (Menezes, 2000). Firstly, in the pharmaceutical area, the professionals involved should be more active in patient care, aiming to ensure

safer treatment results (Pereira *et al.*, 2008). Therefore, pharmaceutical practice is oriented towards patient care, and the drug is seen as a means or tool to achieve results, no longer being the absolute focus of the process. In addition to the proposed humanization, there are aspects related to care for the care environment in the performance of pharmaceutical care. It is essential that the place of the pharmaceutical consultation is sufficient to provide privacy, well-being and trust to patients, so that follow-up can be individualized and relevant interventions can be made (Vieira, 2007).

In this context, the drug is one of the main therapeutic resources used by people, but its use also presents a high risk of damage to health. In the case of poor medication adherence and failure to monitor the patient's treatment, Medication-Related Problems (PRM's) may be observed, impairing pharmacotherapy (Miranda *et al.*, 2012). Therefore, it is worth noting that the Brazilian Unified Health System follows the principles of universality, equity and comprehensiveness, and requires coping practices that go beyond the medical care model (Mendes, 1996). In recent years, many achievements, such as the National Drug Policy, the National Pharmaceutical Assistance Policy, and the National Primary Care Policy, have maximized the performance of pharmacists in Primary Health Care (PHC). In addition, the World Health Organization has also published documents on the renewal of primary care in the Americas, which includes data on Pharmaceutical Services in PHC (Brasil, 1998; Brazil, 2014).

In this scenario, due to the high incidence of the association of type 2 diabetes and dyslipidemia in patients with metabolic disorders, antidiabetic and lipid-lowering drugs are often used simultaneously, in addition to treatment with different types of drugs for other associated diseases such as osteoporosis, gastritis and hormone replacement, and for bacterial and viral infections, for example. This polytherapy requires adequate pharmacotherapeutic follow-up, since it is one of the main risk factors for the development of drug-related problems (PRM's) (Amaral; Perassolo, 2012).

The role of pharmacists in the monitoring of patients affected by Chronic Non-Communicable Diseases (NCDs) and/or TD (Communicable Diseases) in primary care generates many benefits, as it helps to control chronic diseases, prevent and resolve PRM's, improves quality of life and adherence to drug treatment and promotes user awareness on topics related to health promotion, in addition to encouraging self-care, which strengthens their strategic professional position as the promoter of family and community health (Armando *et al*., 2005; Barros *et al*., 2020).

Therefore, this study developed the follow-up of drug therapy in patients with NCDs, undergoing chemotherapy treatment for grade 3 invasive carcinoma (Nottingham) and polymedicated breast cancer, with the aim of promoting health education and the rational use of medications to obtain good results, since low adherence to treatment is an important public health problem. in addition to the complications associated with the lack of control of these diseases, which can lead to an increase in the number of hospital admissions and the mortality rate (Tavares *et al.,* 2016).

2 OBJECTIVES

To develop pharmaceutical care in a patient undergoing treatment for Chronic Non-Communicable Diseases treated at a Basic Health Unit in São Luís-MA.

3 METHODOLOGY

This is a prospective, exploratory, and quantitative study, with follow-up of a patient with breast cancer and metabolic syndrome, from August 2021 to February 2022. In this scenario, patients aged 25 years or older, diagnosed with Chronic Non-Communicable Diseases (NCDs) and polymedicated were included under the inclusion criteria.

Pharmaceutical consultations were carried out monthly at the patient's home after being collected from the primary health care unit in São Luís-MA. As a strategy to perform the follow-up, the patient was instructed about the care plan, pharmaceutical interventions, the need to measure parameters (blood pressure, weight, height), and obtaining the latest laboratory tests to assess the general situation. The method defined to record the patient's clinical evolution was the SOAP (Subjective, Objective, Assessment, Plan) involving data collection (subjective and objective), evaluation and elaboration of a plan with subsequent analysis of the results (Ramos, 2008).

Validated questionnaires were used, based on the materials adopted by the Unified Health System (SUS), such as the PHQ - 9 questionnaire (Patient Health Questionnaire - 9) to assess the severity of depression; the BaMQ (Beliefs about Medicines Questionnaire) to assess the patient's adherence to treatment; and the MOS SF-36 questionnaire (Medical Outcome Study 36-item Short Form) to assess the patient's quality of life, which were applied at the beginning, halfway and end of the follow-up, to assess the impact of the services performed and the interventions proposed during this period.

The information collected and the proposed pharmaceutical interventions were compared, analyzed, and defined according to the information contained in the scientific literature. This research was approved by the Research Ethics Committee of the Federal University of Maranhão (UFMA) (CAAE No. 34652720.9.0000.5087).

4 RESULTS AND DISCUSSION

4.1 CASE PRESENTATION

A.L.C, female, white, 61 years old, housewife, widow, literate, born in Parnaíba - PI and resident of the city of São Luís - MA since 1978. The patient has been diagnosed with systemic arterial hypertension (SAH) and type 2 diabetes (DM2) both for 16 years, and dyslipidemia for 02 years. In 2006, when she was diagnosed with DM2, she was prescribed metformin hydrochloride and glibenclamide and after 10 years of use, the doctor stopped these drugs and prescribed NPH and

Regular insulins. In addition, hydrochlorothiazide and losartan were also prescribed in 2006 for the treatment of SAH. A former smoker, A.L.C. reported that he had given up smoking and drinking alcoholic beverages for more than 24 years when he was pregnant with his first daughter.

In the first half of 2021, the patient felt a lump in her left breast by chance, and in the same week she sought care in the primary health care network, where an ultrasound was requested, which was performed at a private clinic. After receiving the result, she returned to the service of origin, and then was referred to the hospital specialized in cancer to continue the complementary exams and start chemotherapy treatment, in June of the same year.

In addition, the chemotherapy treatment at the end of the pharmacotherapeutic follow-up, in February 2022, was in its fourth cycle. Same month, after mammography and return to the mastologist, the patient reported that at the end of the expected chemotherapy cycles, she will need mastectomy surgery.

In this scenario, days before the start of chemotherapy, the patient had severe headaches and was taken to an Emergency Care Unit with high blood pressure. Two weeks after this episode, the patient returned to the emergency room with the same complaint and, after imaging tests, she was diagnosed with 36 Cerebrovascular Accident (CVA) and remained on the same prescription for the treatment of SAH after the episode. After the patient's recovery, the oncologist started chemotherapy cycles and the addition of ciprofibrate (100mg, 1 time a day). In the same period, the patient went to a consultation with her neurologist/geriatrician due to anxiety and insomnia, and escitalopram 10 mg (1 time a day) was prescribed at the time. However, the patient did not consider starting the use of escitalopram because she had heard from a family member that this medication would make her "sluggish" throughout the day.

At the beginning of pharmacotherapeutic follow-up in August 2021, the patient was diagnosed with Entamoeba histolytica. However, before returning to the doctor's appointment, the patient reported using pariri leaves, boldo and a box of "creolin pills" obtained at the market to treat her amebiasis. During the interview, she reported being on her third day of using these substances and complained about the bitter taste in her mouth. After she reported this, she was advised to suspend the use of this mixture of unknown composition, because when she returned to the doctor to deliver the tests, she had already received a prescription for Secnidazole 1g in a single dose. Regarding her diet, A.L.C. reported consuming an average of 4 loaves of bread and coffee with a little sugar for breakfast, as she did not like the taste of the sweetener; At lunch and dinner, he said he usually consumes rice, pasta, various proteins and flour.

In October 2021, the patient returned to her neurologist/geriatrician, who prescribed buffered acetylsalicylic acid due to the stroke episode. At the end of October 2021, after consultation with the oncologist, rosuvastatin was added to control dyslipidemia in association with the previously

prescribed ciprofibrate, both administered at night by the patient. She also reported that she had stopped using pantoprazole on her own, as she was already using too much "medication," and in addition, she was not experiencing heartburn or other discomfort from the chemotherapy treatment. During the first pharmaceutical consultations, she stated that she had problems with adherence to pharmacological therapy and had pain in her hands and feet as a general complaint, in addition to being in mourning for the death of her husband.

In November 2022, the Ambulatory Blood Pressure Monitoring (AMM) Report requested by the cardiologist indicated abnormal blood pressure values due to failure to respond to prescribed therapy. Thus, the prescription of antihypertensive drugs was modified to losartan 50mg (2 tablets in the morning), and amlodipine 5mg (two tablets in the evening) was added to the treatment.

In February 2022, after mammography and return to the mastologist, the patient reported that at the end of the planned chemotherapy cycles, she will need mastectomy surgery. At the end of this month, in the last pharmaceutical consultation, the questionnaires were applied, anthropometric data and exams were collected, the necessary guidance was given to the patient, and then the pharmacotherapeutic follow-up was completed.

4.2 PHYSICAL AND LABORATORY EXAMINATIONS

At the beginning of the pharmacotherapeutic follow-up, the patient's laboratory tests performed in 2021 were analyzed, which showed decompensated DM2, with glycated hemoglobin values equal to 10.70%, fasting glucose equal to 71.00 mg/dL, hypercholesterolemia of 214 mg/dL, and hypertriglyceridemia of 290 mg/dL (Table 1). At each follow-up visit, the patient's anthropometric parameters were measured (height: 1.57m; weight: 68kg), which made it possible to analyze the patient's BMI, with the first measurement (BMI= 27.59) classifying the patient as overweight (obesity grade I). In addition, the waist circumference was 101 cm, which indicates a result above the desirable for women, which would be 80 to 88 cm (Table 2) (Negrão *et al.,* 2005).

Table 1. Laboratory tests provided by the patient.

EXAMINATION	AGM /2021	NOV/2021	JAN/2022
GLYCATED HEMOGLOBIN	10,70%	-	7,90%
FASTING BLOOD GLUCOSE	71.00 mg/dL	257 mg/dL	122.05 mg/dL
TRIGLYCERIDES	290.00 mg/dL	401 mg/dL	106.84 mg/dL
TOTAL CHOLESTEROL	214.00 mg/dL	196mg/dL	102.00 mg/dL
HDL-CHOLESTEROL	40.10 mg/dL	38.30 mg/dL	34.70 mg/dL
LDL-CHOLESTEROL	129.28 mg/dL	112.13 mg/dL	48.22 mg/dL
NON-HDL CHOLESTEROL	173.90 mg/dL	157.7 mg/dL	67.30 mg/dL
VLDL CHOLESTEROL	44.62 mg/dL	45.57mg/dL	19.08 mg/dL

Source: Prepared by the authors, 2023.

During the pharmacotherapeutic follow-up, the capillary glucose values both in fasting and postprandial were shown to be quite fluctuating. For example, the postprandial blood glucose level at the first visit was 338 mg/dL (Table 2). Analyzing the results of fasting blood glucose laboratory tests, it can be seen that the values range from 71 to 122.05 mg/dL between August 2021 and January 2022 (Table 1).

Table 2. Anthropometric data

PARAMETERS	AUG/21	DEC/21	FEB/21
POST CAPILLARY BLOOD GLUCOSE PRANDIAL	338 mg/dL	334 mg/dL	305 mg/dL
BLOOD PRESSURE	161x93 Mmhg	139x82 mm Mmhg	130x80 cm Mmhg
HEIGHT	1,57m	1,57m	1,57m
WEIGHT	68kg	66,7kg	63kg
MASS INDEX BODY (BMI)	27,59	27,06	25,56
CIRCUMFERENCE ABDOMINAL	101cm	96cm	92cm
FABRIC	9,2	10,8	8,8

Source: Prepared by the authors, 2023.

4.3 PATIENT PHARMACOTHERAPY, ASSESSMENT OF ADHERENCE, DEGREE OF DEPRESSION AND QUALITY OF LIFE

In August 2021, at the beginning of the pharmacotherapeutic follow-up, the patient was in the first cycle of chemotherapy for the treatment of breast CA (paclitaxel), ondansetron 8mg, metoclopramide 4mg, pantoprazole 40mg, paracetamol, and dexamethasone 4mg (Table 3), in addition to escitalopram oxalate 10mg for anxiety and insomnia prescribed by the neurologist/geriatrician (Table 4).

For the treatment of DM2, the patient used NPH 100 IU/mL and Regular 100 IU/mL insulins, and for the treatment of SAH, she used 25 mg hydrochlorothiazide and 50 mg losartan (Table 4). In October 2021, buffered acetylsalicylic acid 100mg was prescribed by the neurologist/geriatrician due

to stroke. After consultation with the cardiologist in November 2022, the prescription was changed with an increase in the dose of Losartan 100mg and the addition of amlodipine 10 mg (Table 4).

To control dyslipidemia, the patient used only ciprofibrate 100mg prescribed after the beginning of chemotherapy, a broad-spectrum lipid modulator. Therefore, in November 2022 the medical oncologist added rosuvastatin 20mg, which is a statin, to the drug therapy, and withdrew dexamethasone 4mg.

In the first consultation, carried out in August 2021, some questionnaires were applied to the patient, such as the Beliefs about Medicines Questionnaire (BaMQ), which measures the patient's beliefs about the therapy and the trend of adherence to treatment. The result was 2.33 (ideal N/P>1), which indicates that the patient has good pharmacological adherence (Graph 1). However, regarding the use of escitalopram, there was no adherence to treatment, justified by insecurity and fear of adverse effects. The MOS SF-36 questionnaire showed low quality of life in the domains related to physical, social and emotional aspects, pain and vitality (Table 5).

Table 3. Chemotherapy prescription

DRUGS	DOSE PROT	DOSE PRESC	DILUENT	VIA	INTERVAL	INF TIME	HE'S (S)
DEXAMETHASONE 10MG EV 10 MIN	8mg	8mg	Saline 0.9% 100ml	HOME	PRE-QT		d1,d8,15
DIPHENHYDRIN 50MG EV 30MIN	50mg	50mg	Saline 0.9% 100ml	HOME	PRE-QT		d1,d8,15
CIMETIDINE 150MG/ML C/2ML HOME	300mg	300mg	Whey physiological 0.9% 100ml	HOME	PRE-QT		d1,d8,15
PACLITAXEL EV BI LIVRE PVC E FILTER EQUIPMENT 0,2MM	80mg/ m2	135.2mg	Saline 0.9% 250ml	EV	.QT	1h0min	d1,d8,15
SALINE 0.9% EV	100ml	100ml		EV	POS-QT		d1,d8,15

COMPLEMENTARY DRUGS TO TREAT ADVERSE EFFECTS OF CHEMOTHERAPY

DRUG/CLASS	DOSAGE	PRESCRIPTION
Ondansetron 8mg Selective Serotonin Receptor 3 Antagonist	01 tablet at 8 a.m. and 8 p.m., for 3 days in a row after chemotherapy	Yes
Metoclopramide 4mg/ml dopamine blocker, antiemetic and Peristaltic stimulant.	40 drops up to 6 hours if nausea or vomiting	Yes
Pantoprazole 40mg Proton Pump Inhibitor	01 tablet/day at 06h for the entire treatment period	Yes

Paracetamol 200mg/ml NSAID selective for COX 3 (COX 1b)	40 drops up to 6 hours if you have pain	Yes

Source: Prepared by the authors, 2023.

Table 4. Pharmacotherapy of the patient at the end of the pharmacotherapeutic follow-up.

DRUG/CLASS	DOSAGE	PRESCRIPTION
Recombinant Human Insulin NPH antidiabetic	Before Coffee: 30u Before Lunch: 30u 9 p.m.: 30u	Yes
Regular Recombinant Human Insulin antidiabetic	Before Breakfast: 14u Before Lunch: 14u Before dinner: 10u	Yes
Losartan 50mg Receptor Antagonist angiotensin II	02 pills in the morning	Yes
Hydrochlorothiazide 25mg thiazide diuretic	01 tablet in the morning	Yes
Amlodipine 5mg Calcium Slow Channel Blocker	02 pills at night	Yes
Ciprofibrate 100mg Ample Lipid Modulator spectrum	01 tablet at night	Yes
Rosuvastatina 20mg Statin	01 tablet in the morning	Yes
Buffered Acetylsalicylic Acid 100mg Platelet aggregation inhibitor	01 tablet before lunch	Yes
Escitalopram 10mg selective reuptake inhibitors Serotonin	1 tablet in the evening	Yes

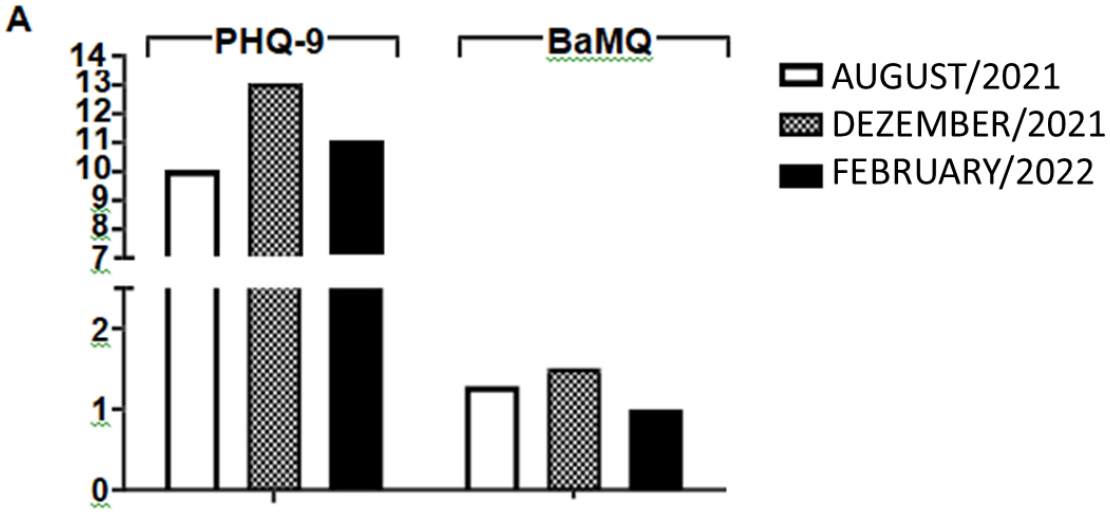
Source: Prepared by the authors, 2023.

Table 5. Quality of Life- MOS SF-36

		Month	
Domain	**August/2021**	**November/2021**	**February/2022**
Functional capacity	15	15	20
Limitation by aspects Physical	0	0	0
Pain	69,5	32	50
General health status	40	67	50
Vitality	45	55	25
Social aspects	50	12,5	12,5
Limitation due to emotional aspects	33	0	0
Metal Health	40	40	44

Source: Prepared by the authors, 2023.

Figure 1. PHQ-9 and BaMQ Charts



Sources: Prepared by the authors, 2023.

Regarding the Patient Health Questionnaire (PHQ-9), an evaluative instrument composed of nine questions that cover items related to depression, the result was 10 (Graph 1) (in an ideal score that should be ≤5), that is, it is suggestive of moderate depression. This may be related to the current context in which the patient finds herself, which involves the treatment of breast cancer and all the uncertainties and afflictions inherent to this condition. In this scenario, since ancient times, cancer has been associated with emotional states, but only recently has this relationship acquired greater clarity, as well as the evident need to link cancer treatment with psychotherapeutic care. For a long time, cancer was seen as a disease linked to resignation and sufferers, either due to the often poor prognosis, limitations and complications intrinsic to the treatment, or due to the lack of clarification about the etiology of the disease (Carvalho *et al.,* 2008; Graner; Cezar; Teng, 2008).

The search for effective treatments for anxiety and depression remains one of the main goals of "Psycho-oncology" [16-17]. The associations between cancer, depression and anxiety are frequent and culminate in a worse clinical outcome and quality of life of patients. The study of depression in oncology has been a challenge for researchers, as many symptoms are mistaken for symptoms of the cancer itself, making its diagnosis complicated and sometimes inaccurate. The diagnosis of depression is made difficult by the mood swings of patients, who feel that their lives are at stake and experience moments of extreme pain and fatigue, especially during the necessary treatment for cancer (Graner; Cezar; Teng, 2008). . Hence the need for the use of escitalopram by the patient, as she had reported difficulty sleeping because 38 was feeling anxious due to her health condition.

4.4 PHARMACEUTICAL INTERVENTION

Adherence to pharmacotherapy is an important factor for the success of any pharmacological treatment, but there are numerous factors that contribute to the lack of adherence, such as the social

and economic factors of the population, factors linked to the health system and the team that makes this machinery work effectively, and factors related to the treatment and the disease itself (WHO, 2003). Thus, it is important to mention that treatment adherence is defined as the degree of agreement between the user's behavior and the guidelines given by the health professional (WHO, 2003; Busnello *et al*., 2001)). Thus, some measures were applied with the aim of improving patient adherence, as the questionnaire applied revealed her to be good adherent, but in practice, there were still gaps. In this sense, it provided guidance accompanied by educational measures, such as the delivery of information leaflets on SAH and healthy eating, a reminder table with the times of administration of all medications, and their correct organization and storage.

Thus, the patient's extensive clinical history and the values measured throughout the follow-up showed overweight (BMI 27.59 kg/m²), high waist circumference (103 cm, high risk of cardiovascular diseases), fluctuating arterial hypertension, hypertriglyceridemia (401.00 mg/dL), presence of insulin resistance (Tyg index: 10.8) (Table 2). This set of data suggests the presence of metabolic syndrome, in addition to favoring the onset of severe cardiovascular events (Zhang; Chen; Ma, 2018).

Metabolic Syndrome (MS) is a complex disorder characterized by a sphere of cardiovascular risk factors, which is commonly concatenated to central fat deposition and insulin resistance. The National Cholesterol Education Program's Adult Treatment Panel III defines MS as the combination of at least three of the following five criteria: Abdominal obesity, with a waist circumference greater than 88 cm in women and 102 cm in men; Arterial hypertension, with systolic blood pressure ≥ 130 and/or diastolic blood pressure ≥ 85 mmHg; Altered blood glucose (≥110 mg/dl) or diagnosis of diabetes; Triglycerides ≥150mg/dl; HDL cholesterol <40 mg/dl in men and <50 mg/dl in women (NCEP, 2001).

Type 2 diabetes mellitus is a metabolic disorder that is rapidly expanding in cases worldwide and highly causes morbidity and mortality, especially in the elderly, but it is also growing among a portion of the young, sedentary and obese population that has unhealthy eating habits (Rao, 2015). This NCD is characterized by pre- and postprandial hyperglycemia, linked to the relative insufficiency of insulin resulting from inadequate secretion of this hormone by the pancreas and its low sensitivity in peripheral tissues. Brazil ranks fourth among the countries with the highest number of diabetics, with about 15 million in 2015 (Lai *et al*., 2019).

Systemic arterial hypertension (SAH) is the most prevalent chronic non-communicable disease in the world. It is estimated that more than 30% of adults have the disease worldwide, and it is more frequent with increasing age. However, the prevalence of the disease varies depending on the site assessed and the measurement methods applied (Mills *et al.,* 2016). SAH is often associated with metabolic disorders, functional and/or structural changes in target organs, and is aggravated by the presence of other risk factors such as dyslipidemia, increased waist circumference, and diabetes

mellitus (Weber *et al.,* 2014). It is a disease characterized by persistently high blood pressure (BP) in the systemic arteries, which is commonly expressed as the ratio of systolic BP (i.e., the pressure blood exerts on arterial walls when the heart contracts) and diastolic BP (the pressure when the heart relaxes) (Oparil *et al*., 2018). Thus, even with the patient's good adherence to the use of antihypertensive drugs, there were oscillations in BP, suggesting PRM-3 (effectiveness), which demonstrated the need 39 for a possible exchange or incorporation of antihypertensive drugs by the prescriber. Thus, during the follow-up, it was suggested to the patient the need for a new consultation with a cardiologist, who requested tests such as M.A.P.A and, after the result, incorporated a new drug (amlodipine) that, combined with the other two drugs already in use, could improve the control of the patient's hypertension.

As a complement to the treatment of DM2, SAH and dyslipidemia, non-pharmacological measures were suggested in order to promote better lifestyle habits, such as the practice of light walks and the importance of complying with the food plan proposed by the nutritionist of the Polyclinic for the Elderly, so that these new eating and physical habits could reduce the patient's initial complaints. Like foot pain, for example.

Healthy food intake and physical activity are two major determinants of energy balance and are considered fundamental in the treatment of diabetic and/or hypertensive patients. Added to this, adequate rest is also important to maintain energy levels and well-being, and all patients should be advised to sleep an average of 7 hours per night (Garber *et al.*, 2016). In this context, there is evidence associating 6 to 9 hours of sleep per night with a reduction in cardiometabolic risk factors, while sleep deprivation aggravates insulin resistance, hypertension, hyperglycemia, and dyslipidemia (Marín-Peñalver *et al.*, 2016). Lifestyle is also a very important factor in the control of DM2, in the sense that eating a low-carbohydrate diet, regular meals, increasing the intake of high-fiber foods, low consumption of high-sodium foods, not consuming alcohol, and achieving a healthy weight are items that should be present in the list of goals of the diabetic person (Park, 2015).

Breast cancer is a multifactorial disease caused by the uncontrolled proliferation of abnormal cells in the breast, which forms a tumor with the potential to invade other organs. There are several types of breast cancer. Some grow fast, others grow slowly. In most cases, if treated appropriately and promptly, the prognosis is good. Breast cancer also strikes men, but it is rare, accounting for only 1% of all cases of the disease. Advancing age is the main risk factor and is related to the grouping of exposures throughout life and to the inherent biological changes in the body with aging (Silva; Silva, 2021; WHO, 2020).

After the pharmacotherapy evaluation, it was found that the patient did not adhere to the pharmacotherapy prescribed for the treatment of anxiety and insomnia, characterizing a PRM-7 of non-adherence in which the individual prefers not to use the medication (Brasil, 2018). During

treatment with anxiolytic drugs, improvement of the condition may not be obtained instantly. After starting treatment with escitalopram, it usually takes 2 weeks for the patient to show improvement, and in some cases there may be increased anxiety at the beginning of treatment, symptoms such as restlessness or difficulty sitting may also occur during the first weeks that disappear over the days (Kirino, 2012). Although there was guidance about the use and particularities of this medication, the patient did not adhere to the treatment (Brasil, 2018). The patient's lack of adherence to drug treatment is considered a public health problem, and has come to be called an "invisible epidemic" (Santa Helena, 2007; Souza; Garnelo, 2008; Bloch; Melo; Nogueira, 2008; Koxma; Reeder; Schulz, 1993). Thus, among the factors that can influence adherence are those related to the treatment itself (duration of treatment, complexity, etc.), to the patient (beliefs, concerns, perception of health status and treatment), social and economic factors (cultural beliefs, fears, lack of access to medications) and factors related to the health system and team (lack of follow-up and guidance of people) (WHO, 2003; Caprara; Rodrigues, 2004; Correr *et al.*,2009; Dean et al., 2010; Gellad *et al.*,2011).

During the second pharmaceutical visit in September 2021, the patient reported that she had stopped taking pantoprazole on her own, because she did not feel any stomach discomfort 40 or heartburn related to the chemotherapy treatment, in addition to considering a high consumption of medications, which also indicates PRM7. Gastric mucosal injury is a frequent event in the natural history of cancer. In this sense, gastroprotection is widely prescribed due to pre-existing or associated conditions. In addition, cancer patients are often exposed to drugs that cause gastric damage such as chemotherapy, steroids, nonsteroidal anti-inflammatory agents (NSAIDs) (Lanza; Chan; Quigley, 2009).

In addition, the use of proton pump inhibitors in the usual doses in combination with antineoplastic drugs such as doxorubicin and ionizing radiation increased the overall survival of patients, in addition to reducing breast cancer recurrence, probably through the inhibition of the fatty acid synthase enzyme (FASN) (Buckley *et al.,* 2017). FASN expression and activity are seen in various human malignancies, such as breast cancer (Chao *et al.,* 2021). FASN is responsible for the endogenous synthesis of long-chain saturated fatty acids and membrane phospholipids and for the expression of the PARP1 gene (poly[ADP-ribose] polymerase 1) which are responsible for the DNA damage repair mechanisms of cancer cells favoring survival, recurrence rates, and metastatic development. Thus, FASN has been an attractive target for the discovery of new adjuvant drugs in the treatment of cancer, such as proton pump inhibitors capable of inhibiting this enzyme (Buckley *et al.,* 2017; Liu; Liu; Zhang, 2010).

Still in the second pharmaceutical consultation, the patient reported that she did not use the insulin pen correctly, a fact proven after demonstrating its application And at this time it was also observed the inadequate storage of insulins, which were placed on the refrigerator door. Thus, the

necessary guidelines were given on its use and correct storage, as well as the disposal of materials used to measure blood glucose.

In this scenario, inadequate storage conditions compromise the quality of insulin, which should be stored in the central part of the refrigerator, between 2 and 10 ºC. Regarding the homogenization of NPH insulin, which is a suspension, it is recommended that it be done subtly, in order to avoid the formation of air bubbles and the dissociation of the molecules, which could alter the stability and efficacy of the medicine. It is necessary that the vial with the contents is homogenized in the palm of the hands, ten to 15 times, slowly (Jehle *et al.*, 1999), with circular movements or pendulum movements; it is also necessary to rotate the application sites, which can be on the back of the arm, abdomen, thighs, or buttocks, as lipodystrophy is avoided (Yokaichiya et al., 2021). In the consultation with the oncologist in November 2021, rosuvastatin was added to control the patient's dyslipidemia, as the tests carried out this month showed the value of triglycerides of 401 mg/dL and total cholesterol of 196 mg/dL.

In the pharmaceutical consultation at the end of the month, the pharmacotherapy was evaluated, and an important drug interaction (PRM 6 – safety) was observed between ciprofibrate and rosuvastatin, with good documentation. It has been revealed that concomitant use of ciprofibrate and hmg-coa reductase inhibitors may result in an increased risk of myopathy or rhabdomyolysis (Zentiva, 2014). The patient did not report symptoms such as muscle weakness, myalgia, or change in urine color, despite the aforementioned interaction. Therefore, it was decided to schedule the two drugs at times far from each other: rosuvastatin in the morning, as it is a long-life statin and can be administered at any time of the day, as long as it is always at the same time chosen (Award et al., 2017; Rosenson, 2022). On the other hand, ciprofibrate was allocated for administration in the evening, after dinner.

Pharmacological treatment associated with guidance on non-pharmacological measures, such as nutritional changes focused on the consumption of foods such as fruits, vegetables, reduction in the consumption of carbohydrates, sodium and fats, reduce BP in hypertensive patients and favor glycemic control in diabetic patients and help improve dyslipidemia

Regarding the episode in which A.L.C was diagnosed with Entamoeba histolytica, amebiasis is an infection caused by this protozoan, being acquired by fecal-oral transmission (Castro et al., 2020). The infection is usually asymptomatic, but symptoms ranging from mild diarrhea to severe dysentery may occur. The disease is treated with metronidazole or secnidazole, for example. Human fecal contamination of contaminated food and water is common, and a problem aggravated by the high incidence of asymptomatic carriers (SBI, 2020). Raw foods, including potentially unsanitized salads and vegetables, and water from dubious sources should be avoided, particularly in developing regions (Neves, 2016). Thus, health education was promoted to the patient, general aspects of the disease, its causes, its treatment and the importance of prevention were explained. it is considered prudent to

explain to the patient the importance of washing food thoroughly before ingesting it, consuming filtered water, always washing hands before putting it in the mouth (WHO, 2004), and how maintaining and sharing these habits with their family members are important measures so that they do not contract Entamoeba histolytica again.

In the first consultation, the patient reported storing the medications in a shoebox, positioned on top of the refrigerator, which is next to the stove. Once drugs have their normal state altered, they can become inactive or even harmful to the user (Valery, 1989). For drugs to be fully effective, that is, their pharmacological action, they must be in adequate conditions of use and within the expiration date (Rocha et al., 2021).

It was proposed that she store the drugs inside their original packaging, as per the guidelines provided by the manufacturer (Yokaichiya et al., 2021). She was given a plastic container with drawers, so that she could better organize the medications, in order not to accumulate fungi and moisture, since every medication has specific physical and chemical properties and microbiological conditions that can be lost due to factors such as temperature, presence of oxygen, sunlight, radiation, humidity and microorganisms (Wells, 2005). Therefore, care must be taken not to damage and destabilize the drugs, because when the drugs are not stored correctly, the stability of the pharmaceutical form is lost, making them unsuitable for use (Yokaichiya et al., 2021; Wells, 2005). The patient should also store the container in another place, such as in her room, as long as there is no direct sunlight at any time of the day, since medications should be stored in places without contact with direct light and that are not hot or humid, such as the bathroom or kitchen, and should always be kept in their original packaging. as these were developed to preserve the physicochemical characteristics of the drug, according to the Center for Drug Studies (CEMED, 2021).

Regarding guidance on healthy eating and physical activity, it is emphasized that obesity is a multifactorial disease and one of these factors is an inappropriate diet. The practice of physical exercise in conjunction with diet tends to promote the reduction of body fat and consequently the attenuation of comorbidities generated by excess fat (Livhits *et al*., 2010). Thus, as a non-pharmacological treatment, the pharmaceutical approach was to guide the visit to the nutritionist. The patient went to see this specialist and received a meal plan aimed at improving DM2 and dyslipidemia.

Improvement in blood glucose control is related to the degree of caloric restriction and weight loss (Henry *et al.,* 1975; Wing *et al.,* 1994). Regardless of weight loss, regular exercise is beneficial for type 2 diabetes. Due to increased insulin reactivity, it may better control blood sugar and may delay the progress of glucose tolerance (Schneider *et al*., 1992). Regular exercise promotes several benefits, such as improvements in anxiety (Stubbs et al., 2017*) and increased cognitive functions (Karssemeijer* et al*.,* 2017).

At the end of the pharmacotherapeutic follow-up, by comparing the questionnaires applied

(PHQ-9 and BaMQ) (Graph 1), it was observed that both the degree of depression and adherence to treatment did not undergo so many changes, remaining practically stable, but not showing significant improvements in the aspects analyzed, also reflecting the little improvement in the patient's quality of life (MOS SF-36) (Table 5). This may possibly be related to the current context in which the patient finds herself, which involves the treatment of breast cancer and all the uncertainties and afflictions inherent to this condition, in addition to mourning for the loss of her husband.

Non-pharmacological interventions were complementary measures that also contributed to the reduction of the patient's initial complaints. Therefore, it is noted that pharmacotherapeutic follow-up reiterates the importance of the pharmacist in the scenario of chronic diseases and polytherapy, helping the patient to be the protagonist of his own story.

5 FINAL THOUGHTS

This case report describes a pharmacotherapeutic follow-up with a patient with metabolic syndrome, breast cancer, and polymedication. It was possible to contribute to the management of a safer and more efficient pharmacotherapy, achieving good adherence, as well as improving quality of life in some aspects. In addition, this study demonstrates the importance of pharmaceutical care in the rational use of medicines and in health promotion.

REFERENCES

AMARAL, Deise Margarete Duarte; PERASSOLO, Magda Susana. Possíveis interações medicamentosas entre os anti-hipertensivos e antidiabéticos em participantes do Grupo HIPERDIA de Parobé, RS (Uma análise teórica). Revista de Ciências Farmacêuticas Básica e Aplicada, v. 33, n. 1, 2012.

ARMANDO, P. et al. Pharmacotherapeutic follow-up of patients in community pharmacies. Atencion primaria, v. 36, n. 3, p. 129-134, 2005.

AWAD, Kamal et al. Effects of morning vs evening statin administration on lipid profile: a systematic review and meta-analysis. Journal of clinical lipidology, v. 11, n. 4, p. 972-985. e9, 2017.

BARROS, Débora Santos Lula; SILVA, Dayde Lane Mendonça; LEITE, Silvana Nair. Serviços farmacêuticos clínicos na atenção primária à saúde do Brasil. Trabalho, Educação e Saúde, v. 18, 2019.

BLOCH, Katia Vergetti; MELO, André Nascimento de; NOGUEIRA, Armando R. Prevalência da adesão ao tratamento anti-hipertensivo em hipertensos resistentes e validação de três métodos indiretos de avaliação da adesão. Cadernos de Saúde Pública, v. 24, p. 2979-2984, 2008.

BRASIL. Ministério da Saúde (MS). Portaria nº 3.916, de 30 de outubro de 1998: Dispõe sobre a Política Nacional de Medicamentos. Diário Oficial da União 1998.

BRASIL. Ministério da Saúde (MS). Cadernos de Atenção Básica: Núcleo de Apoio à Saúde da Família Brasília: MS; 2014.

BRASIL. Secretaria de Atenção à Saúde. Departamento de Atenção Básica Práticas Farmacêuticas no Núcleo Ampliado de Saúde da Família e Atenção Básica (Nast AB). Brasila: Ministério da Saúde, 2018.

BRASIL. Secretaria de Atenção à Saúde. Departamento de Atenção Básica Práticas Farmacêuticas no Núcleo Ampliado de Saúde da Família e Atenção Básica (Nast AB). Brasila: Mnistério da Saúde,i 2018.

BUCKLEY, Douglas et al. Fatty acid synthase–modern tumor cell biology insights into a classical oncology target. Pharmacology & therapeutics, v. 177, p. 23-31, 2017.

BUSNELLO, R. G et al. Características Associadas ao Abandono do Acompanhamento de Pacientes Hipertensos Atendidos em um Ambulatório de Referência. Arq. bras. cardiol., v. 76, n. 5, p. 349- 51, 2001.

CAPRARA, Andrea; RODRIGUES, Josiane. A relação assimétrica médico-paciente: repensando o vínculo terapêutico. Ciência & saúde coletiva, v. 9, p. 139-146, 2004.

CARVALHO, V. Psico-oncologia: conceituação, definições, abrangência de campo. Carvalho VA, Franco MHP, Kovács MJ, Liberato RP, Macieira RC, Veit MT, et al. Temas em psicooncologia. São Paulo: Summus, p. 15-20, 2008.

CASTRO, Andreia Alves et al. Entamoeba histolytica como causa de diarreia crônica. Revista Brasileira de Medicina de Família e Comunidade, v. 14, n. 41, p. 1917-1917, 2019.

Centro De Estudos Do Medicamento (CEMED). Onde guardar medicamentos? Faculdade de Farmácia UFMG.

CHAO J. et al. Proton pump inhibitors suppress DNA damage repair and sensitize treatment resistance in breast cancer by targeting fatty acid synthase. Cancer letters, v. 509, p. 1-12, 2021.

CORRER, Cassyano Januário et al. Avaliação econômica do seguimento farmacoterapêutico em pacientes com diabetes melito tipo 2 em farmácias comunitárias. Arquivos Brasileiros de Endocrinologia & Metabologia, v. 53, p. 825-833, 2009.

DANIELS J, Kissane DW. Psychosocial interventions forcancer patients. Curr Opin Oncol;20:367–371. 2008.

DEAN, Angela J.; WALTERS, Julie; HALL, Anthony. A systematic review of interventions to enhance medication adherence in children and adolescents with chronic illness. Archives of disease in childhood, v. 95, n. 9, p. 717-723, 2010.

GARBER, Alan J. et al. Consensus statement by the American Association of Clinical Endocrinologists and American College of Endocrinology on the comprehensive type 2 diabetes management algorithm–2016 executive summary. Endocrine Practice, v. 22, n. 1, p. 84-113, 2016.

GELLAD, Walid F.; GRENARD, Jerry L.; MARCUM, Zachary A. A systematic review of barriers to medication adherence in the elderly: looking beyond cost and regimen complexity. The American journal of geriatric pharmacotherapy, v. 9, n. 1, p. 11-23, 2011.

GRANER, K. M.; CEZAR, L. T. S.; TENG, C. T. Transtornos do humor em Psico-Oncologia. Temas em psico-oncologia, p. 243-256, 2008.

HENRY, R. R.; SCHEAFFER, L.; OLEFSKY, J. M. Glycemic effects of intensive caloric restriction and isocaloric refeeding in noninsulin-dependent diabetes mellitus. The Journal of Clinical Endocrinology & Metabolism, v. 61, n. 5, p. 917-925, 1985.

JEHLE, Peter M. et al. Inadequate suspension of neutral protamine Hagendorn (NPH) insulin in pens. The Lancet, v. 354, n. 9190, p. 1604-1607, 1999.

KARSSEMEIJER, EGA Esther et al. Positive effects of combined cognitive and physical exercise training on cognitive function in older adults with mild cognitive impairment or dementia: A meta-analysis. Ageing research reviews, v. 40, p. 75-83, 2017.

KIRINO, Eiji. Escitalopram for the management of major depressive disorder: a review of its efficacy, safety, and patient acceptability. Patient preference and adherence, p. 853-861, 2012.

KOZMA, Chris M.; REEDER, C. E.; SCHULZ, Richard M. Economic, clinical, and humanistic outcomes: a planning model for pharmacoeconomic research. Clinical therapeutics, v. 15, n. 6, p. 1121-32; discussion 1120, 1993.

LAI, Yun-Ru et al. HbA1C variability is strongly associated with the severity of cardiovascular autonomic neuropathy in patients with type 2 diabetes after longer diabetes duration. Frontiers in Neuroscience, v. 13, p. 458, 2019.

LANZA, Frank L. et al. Guidelines for prevention of NSAID-related ulcer complications. Official journal of the American College of Gastroenterology| ACG, v. 104, n. 3, p. 728-738, 2009.

LIU, Hailan et al. Biochemistry, molecular biology, and pharmacology of fatty acid synthase, an emerging therapeutic target and diagnosis/prognosis marker. International journal of biochemistry and

molecular biology, v. 1, n. 1, p. 69, 2010.

LIVHITS, Masha et al. Behavioral factors associated with successful weight loss after gastric bypass. The American Surgeon, v. 76, n. 10, p. 1139-1142, 2010.

MARÍN-PEÑALVER, Juan José et al. Update on the treatment of type 2 diabetes mellitus. World journal of diabetes, v. 7, n. 17, p. 354, 2016.

MENDES, Eugênio Vilaça. Um novo paradigma sanitário: a produção social da saúde. Uma agenda para a saúde, v. 2, 1996.

MENEZES, Elber Barboza Bezerra de. Atenção farmacêutica em xeque. Rev. Pharm. Bras, v. 22, p. 28, 2000.

MILLS, Katherine T. et al. Global disparities of hypertension prevalence and control: a systematic analysis of population-based studies from 90 countries. Circulation, v. 134, n. 6, p. 441-450, 2016.

MIRANDA, T. M. M.; PETRICCIONE, S.; FERRACINI FILHO, F. T. WMB. Intervenções realizadas pelo farmacêutico clínico na unidade de primeiro atendimento. Einstein, v. 10, n. 1, p. 74-78, 2012.

NATIONAL CHOLESTEROL EDUCATION PROGRAM (US). EXPERT PANEL ON DETECTION; TREATMENT OF HIGH BLOOD CHOLESTEROL IN ADULTS. Third report of the National Cholesterol Education Program (NCEP) Expert Panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). The Program, 2002.

NEGRÃO, C. E. et al. I Diretriz Brasileira de Diagnóstico e Tratamento da Síndrome Metabólica. Arquivos Brasileiros de Cardiologia. São Paulo: Escola de Educação Física e Esporte, Universidade de São Paulo. 2005.

NEVES, David Pereira. parasitologia hunationalna.13. ed. são paulo: atheneu, 2016.

OPARIL, S. et al. Hypertension Nat Rev Dis Primers. 2018; 4: 18014.

PARK, Kyong. Trends in adherence to dietary recommendations among Korean type 2 diabetes mellitus patients. Nutrition Research and Practice, v. 9, n. 6, p. 658-666, 2015.

PEREIRA, Leonardo Régis Leira; FREITAS, Osvaldo de. A evolução da Atenção Farmacêutica e a perspectiva para o Brasil. Revista brasileira de ciências farmacêuticas, v. 44, p. 601-612, 2008.

PRODUCT INFORMATION: Ciprofibrate oral tablets, ciprofibrate oral tablets. Zentiva (per EMC), Guildford, United Kingdom. 2014.

RAMOS, V.A. Consulta em 7 Passos. Lisboa: VFBM Comunicação. 2008.

RAO, P. V. Type 2 diabetes in children: clinical aspects and risk factors. Indian journal of endocrinology and metabolism, v. 19, n. Suppl 1, p. S47, 2015.

ROCHA, Bruno Simas da. CARACTERIZAÇÃO DOS MEDICAMENTOS DESCARTADOS POR USUÁRIOS DA FPB/FARMÁCIA ESCOLA DA UFRGS. Salão de Extensão (09.: 2008: Porto Alegre, RS). Caderno de resumos. Porto Alegre: UFRGS/PROREXT, 2008., 2008.

ROSENSON, Robert S.; BAKER, Steven K. Statin muscle-related adverse events. www. uptodate. com/contents/statin-muscle-related-adverse-events, 2018.

SANTA HELENA, Ernani Tiaraju de. Adesão ao tratamento farmacológico de pacientes com hipertensão arterial em unidades de saúde da família em Blumenau, SC. 2007.

SBD. Diretrizes da Sociedade Brasileira de Diabetes: 2017-2018. Sociedade Brasileira de Diabetes. São Paulo: Clannad. 2017.

SCHNEIDER, Stephen H. et al. Ten-year experience with an exercise-based outpatient life-style modification program in the treatment of diabetes mellitus. Diabetes care, v. 15, n. 11, p. 1800-1810, 1992.

SILVA, Marcos Mendes; DA SILVA, Valquíria Helena. Envelhecimento: importante fator de risco para o câncer. Arquivos médicos do ABC, v. 30, n. 1, 2005.

Sociedade Brasileira de Infectologia (SBI). Amebíase. 2020 Disponível em: https://www.infectologia.org.br/pg/996/amebias.

SOUZA, Maximiliano Loiola Ponte de; GARNELO, Luíza. " É muito dificultoso!": etnografia dos cuidados a pacientes com hipertensão e/ou diabetes na atenção básica, em Manaus, Amazonas, Brasil. Cadernos de Saúde Pública, v. 24, p. s91-s99, 2008.

SPIEGEL, David; GIESE-DAVIS, Janine. Depression and cancer: mechanisms and disease progression. Biological psychiatry, v. 54, n. 3, p. 269-282, 2003.

STUBBS, Brendon et al. An examination of the anxiolytic effects of exercise for people with anxiety and stress-related disorders: A meta-analysis. Psychiatry research, v. 249, p. 102-108, 2017.

TAVARES, Noemia Urruth Leão et al. Factors associated with low adherence to medicine treatment for chronic diseases in Brazil. Revista de Saúde Pública, v. 50, p. 10s, 2016.

VALERY, Pedro Paulo Trigo. Boas práticas para estocagem de medicamentos. In: Boas praticas para estocagem de medicamentos. 1989. p. 22-22.

VIEIRA, Fabiola Sulpino. Possibilidades de contribuição do farmacêutico para a promoção da saúde. Ciencia & saude coletiva, v. 12, n. 1, p. 213-220, 2007.

WEBER, Michael A. et al. Clinical practice guidelines for the management of hypertension in the community: a statement by the American Society of Hypertension and the International Society of Hypertension. Journal of hypertension, v. 32, n. 1, p. 3-15, 2014.

WELLS, J. Pré-formulação farmacêutica. In: AULTON, M. (Ed.). Delineamento de formas farmacêuticas. 2. ed. Porto Alegre: Artmed. 2005.

WING, Rena R. et al. Caloric restriction per se is a significant factor in improvements in glycemic control and insulin sensitivity during weight loss in obese NIDDM patients. Diabetes care, v. 17, n. 1, p. 30-36, 1994.

World Health Organization (WHO). Organization: Adherence to long-term therapies: evidence for action. Geneva: WHO; 2003.

World Health Organization (WHO). Health topics. Breast cancer: prevention and control. Geneva: WHO, 2020.

World Health Organization (WHO). The World Health Report 2004: Changing History, Annex Table 3: Burden of disease by cause, sex, and mortality stratum in WHO regions, estimates for 2002. Geneva. 2004.

YOKAICHIYA, C. et al. Manual de estruturação de almoxarifados de medicamentos e produtos para a saúde, e de boas práticas de armazenamento e distribuição.

ZHANG, Yaxin; CHEN, Yujing; MA, Lina. Depression and cardiovascular disease in elderly: Current understanding. Journal of Clinical Neuroscience, v. 47, p. 1-5, 2018.

Action of cultural food practices in Pará AIMED at the nutrition of heart disease patients in northern Brazil: An experience report

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ABSTRACT
Introduction: Nutrition education is a health education activity that greatly facilitates the dissemination of knowledge to hospitalized patients, since they generally have no interest in or direct access to information about healthy eating habits. Objective: To educate patients and carers about the nutritional value of açaí in order to minimize myths and doubts about its consumption. Methods: This was a descriptive study reporting on the experience of an educational activity carried out by nutrition interns/researchers and nutritionists at the State Public Foundation Hospital de Clínicas Gaspar Vianna (FPHCGV) in the city of Belém do Pará/Brazil, in March 2023. Results: Each participant was served 200 ml of açaí and 15 g of tapioca flour. After the tasting, an observational survey was carried out, where it was possible to verify that the action represented a satisfactory initiative with excellent acceptability. Conclusion: The action showed positive feedback on the acceptability of the food by the patients and a good understanding of the educational content provided.

Keywords: Nutrition, Cardiac patients, Educational action, Health education.

1 INTRODUCTION

The National Food and Nutrition Policy (PNAN), through its principles, addresses the importance of nutritional education in health in order to promote the autonomy of individuals over their food choices and practices. It also highlights the importance of encouraging health professionals, offering instruments for the implementation of health education strategies with the purpose of disseminating information on food and nutrition , with health-promoting actions. (RABETIM, 2022). Thus, continuing education in health is permeated by several conceptions that are put forward and

made available to health workers who carry out their professional practice in the care of the public of the Unified Health System (SUS) (FERREIRA et al., 2019).

The eating habits of the people of Pará do not follow the nutritional standards of daily recommendations indicated for the Brazilian population, since there is a high consumption of preparations rich in saturated fats, simple carbohydrates, and ultra-processed foods, contributing to the emergence of morbidities and secondary pathologies that can interfere with nutritional status. Açaí, a fruit native to the Amazon, is rich in beneficial nutrients, such as fiber, vitamins, minerals, and antioxidants and is part of the basic diet of a large portion of the population of Pará, especially the riverside peoples who consume it in all meals of the day, as well as in the diet of the urban population (SILVA JUNIOR et al., 2019).

In the performance of the nutrition team at the cardiology clinic of the State Public Foundation Hospital de Clínicas Gaspar Vianna, it was possible to identify questions asked by patients and companions hospitalized at the clinic about the consumption of certain foods, including açaí. This triggered an educational action in order to contribute with information on the subject, in order to minimize the lack of knowledge about the excessive consumption of açaí by heart disease patients.

2 OBJECTIVE

Carry out educational action for patients and companions about the nutritional value of açaí in order to minimize myths and doubts about its consumption.

3 METHODOLOGY

This was a descriptive study of the experience report type of an educational action carried out by nutrition interns/researchers and nutritionists from the Public Foundation Hospital de Clínicas Gaspar Vianna in the city of Belém do Pará, in March 2023. This action is part of the cardiology nutrition research project entitled "**Nutritional risk screening and traditional methods of assessing the nutritional status of cardiac patients**" being carried out at the hospital. A partnership was made with the Nutrition and Dietetics Service (SND), which contributed with the offer of açaí and tapioca flour of good origin, these foods were served for tasting. The target audience consisted of patients admitted to the cardiology clinic, in addition to the patients of the obstetric clinic who were on the same floor. The educational action was authorized by the head of the cardiology clinic. The theme addressed: "Nutritional View on Pará Cultural Food". The entire activity was based on scientific evidence around food, chronic non-communicable diseases and the concepts of Food and Nutrition Education (FNE). The activity was divided into three main moments: a) Lecture on the benefits of açaí and guidance on proper consumption; b) Açaí tasting with tapioca flour; c) Space to clarify doubts and demystify myths about food.

4 DISCUSSION

In the development of the educational action, participatory and dynamic activities were carried out with the use of an explanatory folder and visual media, in order to a more Teaching (DA SILVA, 2022). The space used was the leisure room and television of the cardiology clinic. The target audience reached was about 35, including cardiac patients, companions and obstetrics patients. The multidisciplinary team assisted in the selection of patients who were "stable" so that they could get out of bed and participate in the activity. Each of the participants was served 200 ml of açaí and 15 g of tapioca flour. After the tasting, the observational research was carried out where it was possible to verify that the action It represented a satisfactory initiative with excellent acceptability and positive feedback on the acceptability of the food and educational content passed on.

Doubts and reports about eating habits were shared with the team, who encouraged and guided questions about these that could be improved. It has been observed that a considerable percentage of patients are hospitalized for a long time, referring to the emotional factor of homesickness. The action rescued the patients' contact with their homes through the sensory activities proposed by the nutrition team. Regarding the contribution of knowledge about nutrition, he brought to heart disease patients the reflection of glycemic control for the prevention of diabetes and reduction of the levels of fats in the blood, such as cholesterol and triglycerides. In the context of what was collected during the listening and taking into account the long hospitalization time, it was possible to confirm the importance of health actions aimed at Nutritional Food Education (EAN) (BEZERRA, 2022).

There were reports and inquiries of doubts about açaí, how to consume it, when to consume it, whether it is good or bad because of the existing pathology and its benefits. It can be said that during the action the team involved took into account the concepts discussed above, already previously studied, in order to provide a better reception, listening, non-formal and friendly conversation above all with humanization, these were the strategies used to achieve the objectives aimed at by the referred action.

5 CONCLUSION

Considering the frequency and the way in which the food "açaí" is consumed in the North region, the need for nutritional guidance for patients and companions about the amount to be consumed was relevant in this study. Since adequacy in consumption can bring several benefits to health in general.

REFERENCE

BEZERRA, R. K. C. et al. Percepção de Usuários Hipertensos e Diabéticos Sobre Práticas de Educação Alimentar e Nutricional em um Grupo de HIPERDIA no Sertão Cearense. Saúde e Desenvolvimento Humano, v. 10, n. 1, 2022.

DA SILVA, G. M. Relato de experiência: desafios da intervenção pedagógica na Educação Infantil em tempos de pandemia. Revista Educação Pública, v. 22, n. 33, 2022.

FERREIRA, L. et al. Educação Permanente em Saúde na atenção primária: uma revisão integrativa da literatura. Saúde em Debate, v. 43, n. 120, p. 223–239, 2019.

RABETIM, V. Princípios e práticas para educação alimentar e nutricional. 2022.

SILVA JUNIOR, J. I. de S. et al. Socioeconomia e qualidade do solo em áreas nativas e cultivadas com açaizeiros no Estado do Pará. Tese de Doutorado. UFRA/Campus Belém. 2019.

Endometritis secondary to infected abortion – Case report

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ABSTRACT
Early pregnancy loss takes many forms, with miscarriage being the loss that occurs in the first trimester of pregnancy. We can subdivide abortion into different forms, namely: spontaneous, retained, unavoidable, incomplete, recurrent, complete and septic abortion. Septic abortion is defined as any abortion that evolves to a more complicated condition due to the presence of endometritis, parametritis or infection of the upper genital tract and the treatment usually includes the use of antibiotic therapy, associated with evacuation of the retained conceptus. In this case report, the patient (female and 34 years old) presented bleeding at 14 weeks of gestation associated with vaginal discharge of contents similar to "flesh", foul odor and high fever. The diagnostic hypothesis was that she had an infected abortion, and she was requested for complementary tests, and she was referred for uterine emptying associated with antibiotic therapy. The patient progressed with improvement of clinical symptoms and was discharged from the service with the use of antibiotics. However, the patient returned 9 days later with abdominal pain in the lower abdomen with greenish discharge and ultrasound with signs suggestive of endometritis. The patient underwent magnetic resonance imaging that confirmed the hypothesis associated with a risk of sepsis, therefore, she underwent subtotal hysterectomy and bilateral salpingectomy.

Keywords: Abortion, Retained, Infection, Sepsis, Curettage, Uterine emptying.

1 INTRODUCTION

Early pregnancy loss takes many forms, with miscarriage being the loss that occurs in the first trimester of pregnancy or before 20 weeks. We can subdivide abortion into different forms, namely: spontaneous, retained, unavoidable, incomplete, recurrent, complete and septic abortion [1,2].

Infected abortion, which will be addressed in this case report, is defined as an abortion complicated by an intrauterine infection and may be associated with abortion induced by inadequate and unsafe techniques. These infections are usually polymicrobial and therefore require broad-spectrum antibiotic treatment and surgical removal of the material retained in the uterus. This condition can evolve with serious complications such as uterine perforation, hemorrhage, gas embolism, and pelvic infection [3]. In addition, a risk of sepsis can also be visualized, for example, due to endometritis and other infections [4].

Among the other complications, acute endometritis not associated with pregnancy stands out in this context, which consists of an alteration in the endometrial microbiota, leading to an infectious process. In 85% of cases, endometritis is associated with sexually transmitted infections, but more rarely, it can be related to uterine instrumentation, such as biopsy and IUD placement [5,6]. According to the case studied, there was intrauterine manipulation through uterine curettage, causing the endometritis process presented.

2 CASE REPORT

In this report, the patient (female and 34 years old) presented bleeding at 14 weeks of gestation associated with vaginal discharge of contents similar to "flesh", foul odor and high fever. The diagnostic hypothesis was that of an infected abortion, complementary tests were requested, and the patient was referred for treatment through uterine emptying associated with antibiotic therapy. There are no reports of attempted induced abortion. She underwent two uterine curettage procedures due to the persistence of symptoms and fetal remains. The patient progressed with improvement of clinical symptoms and was discharged from the service with the use of antibiotics. However, the patient returned 9 days later with abdominal pain in the lower abdomen with greenish discharge and ultrasound with signs suggestive of endometritis. The patient underwent magnetic resonance imaging that confirmed the hypothesis, in view of the diagnosis and the risk of sepsis, and underwent subtotal hysterectomy and bilateral salpingectomy.

3 OBJECTIVES

To expose a rare case of infected abortion, which progressed to hysterectomy. Deepen knowledge in relation to the subject and expand the area of study within Gynecology and Obstetrics.

4 METHOD

Information was obtained through a review of medical records, interviews with the patient, and a review of the literature.

5 DISCUSSION

Delayed abortion presents as an asymptomatic death of the fetus, without uterine contractions, capable of expelling the embryo [1]. Ultrasonography (USG) is important for diagnosis, allowing the differentiation between complete and incomplete abortion as it allows the identification of the gestational sac, embryonic remains and vital activity of the embryo [7]. In the patient presented, the imaging test suggested an incomplete abortion due to the presence of heterogeneous material [8].

Therefore, in the report cited The patient reported cramping-like abdominal pain, vaginal bleeding, foul odor, high fever, associated with loss of material vaginally similar to flesh. Based on the clinical picture exposed, the suggested diagnostic hypothesis was infected abortion, which consists of an infectious process with clinical signs pertinent to those mentioned, which may be restricted to the endometrium or expand to other adjacent structures [3]. This condition is usually associated with inappropriate attempts to terminate the pregnancy, so it is always important to ask the patient [3]. In this sense, she was questioned and denied having taken any kind of action to induce the abortion.

Due to the infectious condition, antibiotic therapy was started and, as the pregnancy was more than 12 weeks gestation, which evolved with infected abortion and the The primary treatment is the removal of infected and devitalized tissues, even in the presence of continuous fetal heartbeats, the use of misoprostol 200 micrograms was indicated for cervical dilation, followed by two uterine wintercurettages [4,9]. This procedure is done with the use of dilators and promotes the scraping of the uterine cavity in order to detach and remove the retained material [10]. If the pregnancy was less than 12 weeks, manual intrauterine aspiration (MVA) could be the best indication, since it is a less invasive procedure for the patient and does not cause endometrial injury, avoiding the occurrence of uterine synechiae after the procedure.

The abortion scenario involves several complications, including post-abortion infection or endometritis, which involves microorganisms such as Gram-positive and negative bacteria and anaerobic organisms [5]. The diagnosis is clinical and the incidence is higher in unsafe abortions, with severe cases being more infrequent (5.1% of unsafe abortions) [11]. Treatment consists of broad-spectrum antibiotic use and surgical intervention may be necessary if the infection produces a collection of drainable fluid in the cavity, if there are greater risks, Evidence of organ perforation and/or tissue necrosis in a septic abortion [12]. In addition, the The presence of gas in the myometrium on radiological imaging is suggestive of the presence of*Anaerobic clostridium in* infection, which in many cases requires a hysterectomy to remove infected tissue [13].

In this sense, according to the persistence of the condition, associated with complementary imaging tests that demonstrated an enlarged uterus (905.5 cm^3) and the presence of fluid in the cavity. The patient in question was referred to the operating room for treatment (subtotal hysterectomy with bilateral salpingectomy). Other sonographic alterations, which when present speak in favor of post-abortion infection and endometritis, are increased myometrial vascularization, hydrosalpinges, or an adnexal mass, which may suggest an abscess [14].

6 CONCLUSION

Finally, infected abortion, despite not being present among the most common types, can evolve with serious complications, putting female fertility at risk, that is, evolve with more serious infections,

such as endometritis, and consequently lead to sepsis. The underlying treatment consists of immediate evacuation of infected uterine contents associated with broad-spectrum antibiotic therapy. This can normally be done through suction curettage or a blunt curette, however, if patients do not respond promptly to uterine emptying and intravenous antibiotics, aggressive surgical intervention, including hysterectomy, may be required to save lives, while delay can be fatal.

CONFLICT OF INTEREST

We declare for all due purposes that there is no conflict of interest in this case report.

REFERENCES

Alves C, Rapp A. Spontaneous Abortion. 2022 Jul 18. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan–. PMID: 32809356.

Griebel CP, Halvorsen J, Golemon TB, Day AA. Management of spontaneous abortion. Am Fam Physician. 2005 Oct 01;72(7):1243-50

Moraes Filho OB. Aborto: classificação, diagnóstico e conduta. Protocolo Febrasgo - Obstetrícia, no 21. Federação Brasileira das Associações de Ginecologia e Obstetrícia (Febrasgo); 2018.

Udoh A, Effa EE, Oduwole O, Okusanya BO, Okafo O. Antibiotics for treating septic abortion. Cochrane Database Syst Rev. 2016 Jul 1;7(7):CD011528. doi: 10.1002/14651858.CD011528.pub2. PMID: 27364644; PMCID: PMC6458041.

Taylor M, Jenkins SM, Pillarisetty LS. Endometritis. [Updated 2023 Feb 3]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK553124/#

Sajadi-Ernazarova KR, Martinez CL. Abortion Complications. 2022 May 23. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan–. PMID: 28613544.

Hendriks E, MacNaughton H, MacKenzie MC. First Trimester Bleeding: Evaluation and Management. Am Fam Physician. 2019 Feb 1;99(3):166-174. PMID: 30702252.

Kim C, Barnard S, Neilson JP, Hickey M, Vazquez JC, Dou L. Medical treatments for incomplete miscarriage. Cochrane Database Syst Rev. 2017 Jan 31;1(1):CD007223.

Eschenbach DA. Treating spontaneous and induced septic abortions. Obstet Gynecol. 2015 May;125(5):1042-1048. doi: 10.1097/AOG.0000000000000795. PMID: 25932831.

Rocha Neves A, Pietzsch Dieter I. Estudo sobre Abortamento no Brasil: Comparação entre Países onde A Prática é Legalizada com ou sem Restrições: Revista Acadêmica Online. Disponível em: <https://www.revistaacademicaonline.com/news/estudo-sobre-abortamento-no-brasil-comparacao-entre-paises-onde-a-pratica-e-legalizada-com-ou-sem-restricoes/>. Acesso em: 2 jun. 2023.

Bridwell RE, Long B, Montrief T, Gottlieb M. Post-abortion Complications: A Narrative Review for Emergency Clinicians. West J Emerg Med. 2022 Oct 23;23(6):919-925. doi: 10.5811/westjem.2022.8.57929. PMID: 36409940; PMCID: PMC9683756.

Karsnitz DB. Puerperal infections of the genital tract: a clinical review. J Midwifery Womens Health. 2013 Nov-Dec;58(6):632-42. doi: 10.1111/jmwh.12119. PMID: 24406036.

Wall LL, Yemane A. Infectious Complications of Abortion. Open Forum Infect Dis. 2022 Nov 23;9(11):ofac553. doi: 10.1093/ofid/ofac553. PMID: 36438622; PMCID: PMC9683598.

Nikolic O, Basta Nikolic M, Spasic A, Otero-Garcia MM, Stojanovic S. Systematic radiological approach to utero-ovarian pathologies. Br J Radiol. 2019 Jul;92(1099):20180439. doi: 10.1259/bjr.20180439. Epub 2019 Jun 6. PMID: 31169406; PMCID: PMC6636271.

SEVEN publicações acadêmicas

The practice of water aerobics with the elderly: Physical and psychological aspects

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ABSTRACT

This Chapter addresses the content on the practice of physical activities by the elderly in the aquatic environment, more specifically water aerobics. It will discuss the importance of water aerobics socially and physiologically for the elderly and its main benefits; from the prevention to the treatment of diseases that are linked to the aging phase. Worldwide, there is a notorious increase in the population aging process, so it is necessary to perpetuate good eating habits and physical activities, so that this phase is not associated with an increase in pathological conditions. Regarding these practices, water aerobics gives back to the elderly autonomy, self-esteem, greater social bond with new friendships during classes; In addition to physiological benefits such as; improvement of muscular endurance, increase of strength,

flexibility, improvement of physical skills and capacities, among others. In this Chapter we will also see that water aerobics brings in its practical proposal, the use of music and the diversity of materials, making it even more pleasurable, playful and special for the elderly. With all its differentials and facilities of execution and good adaptation by this public, this activity also helps to return more quality of life to patients in the treatment of diseases such as ankylosing spondylitis and lymphedema. Therefore, it is concluded that the practice of water aerobics is an excellent alternative for health promotion, prevention and treatment of diseases in the elderly.

Keywords: Aging, Physical activity, Exercise.

1 INTRODUCTION

1.1 PHYSICAL ACTIVITY IN THE ELDERLY

Around the world, we are experiencing the growth of an aging population. This transformation in society elucidates the concern with quality of life, obtained, especially, by non-pharmacological tools, through the practice of systematic physical activities, healthy eating, leisure, among others. In 2010, there were 39 elderly people for every 100 young people, in 2040, it is estimated that there are 153 elderly people for every 100 young people. The country is not prepared for the needs generated by this aging population, with the challenges of adapting social security and the health system (Miranda; Mendes; Silva, 2016).

Throughout life, the elderly go through different physiological and social changes that make them vulnerable. Therefore, their life trajectory directly influences the aging process (Geib, 2012). According to the complexity of the health context and the services needed to maintain their health, there will also be a need to promote a healthier and more active lifestyle (Schenker, Da Costa, 2019).

According to the Statute of the Elderly, a person who is 60 (sixty) years of age or older is considered elderly (Brasil, 2009). This phase of life is accompanied by several changes, such as reduced visual and auditory ability, loss of ability and neurological functions such as reasoning and memory, as well as changes in aesthetic aspects (hair color, wrinkles) and decreased muscle strength, joint range and flexibility, factors that affect the mental health of the elderly and can lead to psychological diseases such as anxiety. depression and stress (Costa *et al.*, 2018).

Each elderly person goes through the aging process in a unique way, often associated with the disease process. Illness is usually linked to the awareness of the feeling of pain and physical disability (Linck *et al.*, 2008). Often, depending on the disease, the elderly still carry social stigmas that hinder their treatment, as is the case of depression, seen at various times as a "rich man's disease" and not as a health problem (Schenker, Da Costa, 2019).

Following the international recommendations for the health of the elderly, the systematic practice of physical exercise can attenuate and reduce depressive or anxiety symptoms. In addition to improving the ability to perform daily activities and maintaining their independence (Izquierdo *et al.,* 2021). Aquatic activities can be a key factor, as it is already possible to observe that an adequate low-

intensity aerobic training program in an aquatic environment favors the reduction of anxiety and depression scores, in addition to helping with oxidative stress in the body of the elderly (Silva *et al.*, 2019).

In addition to walking, adequate strength training, and pedaling, water aerobics is an excellent conditioning program for the elderly, which includes aerobic exercises and exercises for the development of localized muscular endurance, muscle strength, and flexibility (Barros; Ritti-Dias, 2010; Silva *et al.*, 2019).

Unlike water aerobics, hydrotherapy is also a physical exercise practice performed in the water, but only in heated pools. It is also an excellent ally for the treatment of diseases in the elderly and can be worked on as a way to prevent diseases and maintain health. Its recommendation ranges from muscle strengthening to the most severe cases of rehabilitation; trauma or cardiac treatments. Many group activity centers, gyms and clubs offer dynamic, cheerful and attractive water aerobics or hydrotherapy classes, providing great social interaction among the elderly. This interaction, in turn, generates excellent benefits in the mental health of the elderly (Xavier; Dati, 2021).

The interaction with new friendships, provided through the meeting of people with different needs and the human welcome mediated by the teacher during the water aerobics classes, favors precisely the psychological components that stimulate affective bonds. These bonds often take the elderly out of a state of loneliness due to a possible social distancing, reducing the risks of depression. In this way, water aerobics gives back to the elderly a new meaning to live, with much more autonomy and self-esteem (Da Silva, 2017; Souza; Simões, 2007).

1.2 WATER AEROBICS IN OLD AGE

Activities in the aquatic environment arose before Christ, from the time of Hippocrates in baths that helped in the treatment of diseases; through the Romans who used this practice for healing and recreational purposes. Therefore, it is understood that the use of water was intimately linked to mystical and religious issues (De Paula; De Paula, 1998).

The word Hydrogymnastics originated from the Greek, which means "gymnastics in the water" and its practice in a planned way with well-defined objectives took place in Germany, seeking to serve a group of people with advanced age who needed to practice a safe physical activity, without risks or joint injuries and provide them with well-being (De Paula; De Paula, 1998). The main advantage found in the practice of Water Aerobics is the safety that your patient has to exercise, since it is an activity in which the incidence of impacts is much lower compared to activities performed outside the water. Thus, there are numerous benefits acquired for the health of the elderly practitioner of water aerobics (Costa *et al.,* 2018).

Among the various benefits that water aerobics or hydrotherapy can provide to the elderly, Xavier and Dati (2021, p. 45) highlight some of the most relevant ones in their study, such as:

> Increased or maintained range of motion (flexibility); Pain reduction; Increased strength, especially of the muscle groups involved in the affected joint; Promotion of relaxation and relief of muscle spasm; Work on the functional ability of gait; Performing functions that cannot be performed on the ground or are performed with difficulty; Improvement in coordination and postural correction, establishing healthy postural habits; Proprioceptive training; Improvement in respiratory and cardiovascular capacity; Maintain the range of motion and muscle strength of the unaffected joints; Restore self-confidence and independence, improve morale and self-image; Socialization and recreation.

The differential of water aerobics compared to other physical activities is, in addition to the use of music, a diversity of materials such as dumbbells, poles, floats, among others. Thus, the classes become lighter and more joyful, motivating the elderly and consequently reducing stress, due to the properties they have to the waters. As a result, this modality becomes more common in this audience, due to buoyancy, reducing impacts and body weight (Silva, 2021)

As seen, the exercises performed during water aerobics classes can provide several benefits according to the objectives proposed by their practice to the elderly. Thus, it is observed that this activity presents itself as an excellent tool for physical exercise, rehabilitation, relaxation and attention to physical and mental health in this population (Souza, 2017).

Regarding the benefits, water aerobics is a physical activity with no health risks. Thus, this activity helps to delay physical and mental aging, improves physical fitness and capacities, reduces anxiety and stress levels, promotes healthy sleep habits, maintains healthy blood circulation, and has therapeutic healing effects (Santos; Vilela, 2020).

Taking into account the natural aging process, neuromuscular changes occur that generate a low tolerance to physical exercise in the elderly. There will, therefore, be an increase in functional dependence; predisposition to risk of falls; Fractures; hospitalizations and mortality, in addition to limiting their activities of daily living and loss of autonomy (Macedo; Gazzola; Nahas, 2008; Campbell, Buchner, 1997). Water aerobics, as well as other physical exercise practices, when performed in a planned manner, mitigate all these decline processes observed during aging, promoting an improvement in the quality of life of the elderly (Merquiades *et al.*, 2009; Farinatti, 2008).

1.3 WATER AEROBICS IN THE PREVENTION AND TREATMENT OF DISEASES

In the prevention and treatment of diseases, water activities seem to effectively help improve the quality of life of the elderly. In a recent systematic review, it was possible to observe a significant improvement in motor disabilities in elderly patients with Parkinson's disease when submitted to regular aquatic activities, such as water aerobics, especially when compared to elderly people who did

not have any type of intervention, in addition to attenuating greater benefits in balance and muscle strength compared to land exercises in this population (Cugusi *et al.,* 2019).

On the other hand, although the prescription of physical activities is responsible for observing the intrinsic and extrinsic principles of the individual, there are some recommendations that can be generalized, such as the sequencing of activities, in addition to the physiological determinants of transference, ambulation and chronic condition of the elderly, regardless of whether this activity is performed in an aquatic environment or not (Izquierdo *et al.,* 2021).

In connective tissue inflammations, such as ankylosing spondylitis, water aerobics appears to have positive effects in improving the reduction of disease activity with the relief of pain intensity (Liang *et al.,* 2021). In patients with lymphedema, despite positively favoring the improvement of lymphatic drainage, more studies are needed to define specific protocols with water aerobics for this disease (Maccarone *et al.,* 2023).

2 FINAL THOUGHTS

The practice of water aerobics slows down the main bodily changes that are part of the normal course of the aging process. It can be concluded that the elderly should be aware of the particularities of water aerobics to take advantage of all the advantages it offers for the physical activity program in the age of age. Undoubtedly, this pleasant way of exercising has already captivated, whether for its physical results or for its psychological and social well-being, many fans.

It is essential that people become aware that the practice of physical activities combat and help in the treatment of various diseases, prevents the appearance of new pathologies associated with age and allows the degenerative effects of individuals over sixty years of age to be slow. The study reveals that the regular practice of water aerobics allows the achievement of a qualitatively healthier life.

After all, tackling this issue is urgent, as the country has an increasing rate in the percentage of elderly people, which means that the demand for specialized services increases in the same proportion and requires planning on the part of current social public policies.

It is important to make the elderly aware that the incorporation of movement into life based on the inclusion of the fact in the routine means a new direction to existence, it is taken care of with oneself, for this reason, it enables quality of life as a real concept.

REFERENCES

BARROS, H.R.; RITTI-DIAS R.M. Relação entre atividade física e densidade mineral óssea/osteoporose: uma revisão da literatura nacional. Revista de Educação Física, Rio Claro, SP, BR, 2010.

Brasil. Ministério da Saúde. Estatuto do Idoso / Ministério da Saúde. v.1, n, 2, p.1 -70. rev. – Brasília: Editora do Ministério da Saúde, 2009.

CAMPBELL, J.; BUCHNER, D. Unstable disability and the fluctuations of frailty. Age Ageing, v. 26, n. 4, p. 315-8, 1997.

COSTA, R. R. *et al.* Water-based aerobic training improves strength parameters and cardiorespiratory outcomes in elderly women. Experimental gerontology, v. 108, p. 231-239, 2018.

CUGUSI, L. *et al.* Aquatic exercise improves motor impairments in people with Parkinson's disease, with similar or greater benefits than land-based exercise: a systematic review. Journal of physiotherapy, v. 65, n. 2, p. 65-74, 2019.

DA SILVA, J. F; *et al.* Hidroginástica: Interações Sociais, Saúde e Qualidade de Vida dos Idosos. Revista Científica Multidisciplinar Núcleo do Conhecimento, v. 1, n. 2, p. 503-520, 2017.

DE PAULA, K. C.; DE PAULA, D. C. Hidroginástica na terceira idade. Revista Brasileira Medicina do Esporte, v. 4, n. 1, p. 24-27, 1998.

FARINATTI, P. T. Envelhecimento, promoção da saúde e exercício: bases teóricas e metodológicas. Barueri, SP; Manole; v. 1; 2008.

GEIB, L. T. C. Determinantes sociais da saúde do idoso. Ciência & Saúde Coletiva, v. 17, n. 1, p. 123-133, 2012.

IZQUIERDO, Mikel *et al*. International exercise recommendations in older adults (ICFSR): expert consensus guidelines. The journal of nutrition, health & aging, v. 25, n. 7, p. 824-853, 2021.

LIANG, Z. *et al.* Effects of water therapy on disease activity, functional capacity, spinal mobility and severity of pain in patients with ankylosing spondylitis: a systematic review and meta-analysis. Disability and Rehabilitation, v. 43, n. 7, p. 895-902, 2021.

LINCK, C. L.; BIELEMANN, V. L. M.; SOUSA, A. S.; LANGE, C. Paciente crônico frente ao adoecer e a aderência ao tratamento. Acta Paulista de Enfermagem, v. 21, n. 2, p. 317-322, 2008.

MACCARONE, M. C. *et al.* Water-based exercise for upper and lower limb lymphedema treatment. Journal of Vascular Surgery: Venous and Lymphatic Disorders, v. 11, n. 1, p. 201-209, 2023.

MACEDO, C.; GAZZOLA, J. M.; NAHAS, M. Síndrome da fragilidade no idoso: importância da fisioterapia. ABCS Health Sciences, v. 33, n. 3, p. 177-84, 2008.

MERQUIADES, J. H.; AGRA, J. H. M.; ALBUQUERQUE, K. M. D.; COSTA, R. C.; NAVARRO, A. C. A importância do exercício físico para a qualidade de vida dos idosos. Revista Brasileira de Prescrição e Fisiologia do Exercício, v. 3, n. 18, p. 597-214, 2009.

MIRANDA, Gabriella Morais Duarte; MENDES, Antonio da Cruz Gouveia; SILVA, Ana Lucia Andrade da. Population aging in Brazil: current and future social challenges and consequences. Revista Brasileira de Geriatria e Gerontologia, v. 19, n. 3, p. 507-519, 2016.

SANTOS, G. DA A.; VILELA, A. T. BENEFÍCIOS FÍSICOS HIDROGINÁSTICA NA TERCEIRA IDADE. Revista Prisma, v. 1, n. 2, 21 out. 2020.

SCHENKER, M.; DA COSTA, D. H. Avanços e desafios da atenção à saúde da população idosa com doenças crônicas na Atenção Primária à Saúde. Ciência & Saúde Coletiva, v. 24, n. 4, p. 1369-1380, 2019.

SILVA, Camila Bellumati. HIDROGINÁSTICA NA TERCEIRA IDADE. Trabalho de Conclusão de Curso Graduação em Educação Física – Centro de Ciências Empresariais e Sociais Aplicadas, Universidade Pitágoras Unopar, Barra de São Francisco, p. 47. 2021.

SILVA, L. A. *et al.* Effects of aquatic exercise on mental health, functional autonomy and oxidative stress in depressed elderly individuals: A randomized clinical trial. Clinics, v. 74, 2019.

SOUZA, C. A.; SIMÕES, R. Hidroginástica e Idosos: por que eles praticam? Movimento, v. 13, n. 1, 2007.

SOUZA, Lenneker Magno Silva De. A IMPORTÂNCIA DA PRÁTICA DA HIDROGINÁSTICA NA TERCEIRA IDADE: COMBATE AO SEDENTARISMO. Trabalho de Conclusão de Curso (Bacharelado em Educação Física) - Faculdade Escritor Osman da Costa Lins – FACOL. Vitória de Santo Antão, p. 11. 2017.

XAVIER, S. C. B. S.; DATI, L. M. M. Gerontologia: A influência da hidroterapia na qualidade de vida dos idosos. Revista Longeviver, v. 12, 2021.

SEVEN publicações acadêmicas

Efficiency in the management of civil construction waste with the adoption of the integrated waste exchange system in Brazil

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ABSTRACT

Federal Law No. 12,305/2010, which provides for the National Solid Waste Policy, establishes that: "Civil Construction Waste (RCC) originates in the construction, renovation, repair and demolition of works, as well as those resulting from the preparation and excavation of land for construction". In addition, the legislation specifies the responsibility of waste generators for collection, transportation, transshipment, and final disposal, aiming at reduction, reuse, recycling, proper treatment of waste and a lower environmental impact. Currently, some industry federations have platforms that aim to promote and facilitate transactions related to the waste produced by their members, however, most operate in isolation. The National Confederation of Industries (CNI) has created a web platform developed for integrated operation that allows the adhesion of state industry federations. Of the twenty-seven federative units of Brazil (Federal District and twenty-six states), the states of São Paulo, Rio de Janeiro, Rio Grande do Sul, Santa Catarina and Mato Grosso do Sul (about 19% of the total) have isolated (non-integrated) Recyclables/Waste Bags and only the states of Paraná, Minas Gerais, Bahia, and Sergipe (15%) participate in the Integrated Waste Exchange System (SIBR) of the National Confederation of Industries. This research aims to present the positive points of the integrated system and propose the use of SIBR in all federative units of Brazil. Initially, it was found that the SIBR system, in addition to facilitating and enabling the execution of transactions such as the intermediation of the sale, exchange, and donation of materials / products, also provides the reduction of costs and time, because of the integration, also contributing to the correct disposal of waste and, consequently, to environmental preservation.

Keywords: Integrated Waste Exchange System, Sustainable Management of CCRs, National Confederation of Industries, Civil Construction, Brazil.

1 INTRODUCTION

As civil construction is one of the industries that most impacts the environment in all its phases, whether in the use of raw materials, transportation and in the production process, especially due to the large generation and disposal of waste, it is of great importance to create tools that streamline the process of negotiating construction waste.

The Integrated Waste Exchange System of the National Confederation of Industries integrates the existing isolated systems, creating a single national platform, presenting a significant reduction in operational and personnel costs, streamlining information on all waste available nationally, resulting in economic gains and environmental benefits.

2 CONSTRUCTION WASTE AND BRAZIL'S NATIONAL SOLID WASTE POLICY

According to Resolution No. 307/2002 [4] and amendments by the National Council for the Environment – CONAMA of Brazil, civil construction waste is waste from construction, renovation, repair and demolition of works from civil construction, preparation and excavation of land and materials such as bricks, ceramic blocks, wood, concrete, plaster, soils, tiles, rocks, metals, etc. resins, glues, paints, glass, and others.

Federal Law No. 12,305/2010 [2] established the National Solid Waste Policy (PNRS) in Brazil with very modern concepts for a new waste management, proposing the practice of sustainable consumption, including the increase in the reuse of solid waste, reinforcing the hierarchy of avoid, reduce, reuse, recycle and finally adequate treatment. The PNRS brought the shared responsibility of everyone in the waste generation chain, manufacturers, importers, distributors, among others, considering the entire life cycle of materials/products.

To integrate waste management, the National Confederation of Industries (CNI) in Brazil created and implemented the Integrated Waste Exchange System (SIBR) platform with the objective of integrating the information of the exchanges in a single database.

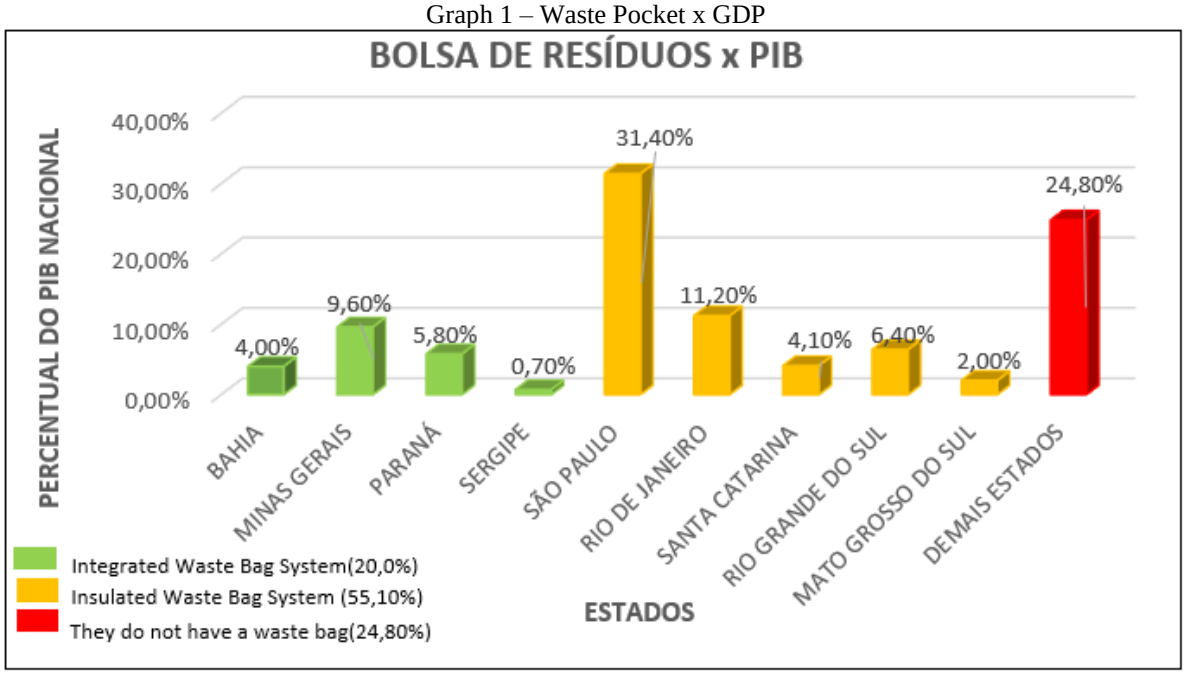
3 OVERVIEW OF WASTE POCKET SYSTEMS IN BRAZIL

Waste/recyclable exchanges are websites linked to the State Federations of Industries that allow the purchase, sale, exchange, or donation of industrial waste – plastic scraps, paper, wood, scrap metal, construction waste, among others that are generated during industrial activities [1].

The waste/recyclable bags aim to avoid waste, improper disposal, reducing environmental impact in addition to bringing economic benefits to the participants of the system.

In the current Brazilian scenario, of the twenty-seven federative units of Brazil, only the states of Paraná, Minas Gerais, Bahia and Sergipe (15% of the total federative units) corresponding to 20.10% of the Gross Domestic Product (GDP) participate in the Integrated System of Waste Exchange – SIBR. On the other hand, the states with isolated waste exchange systems are Rio de Janeiro, São Paulo, Santa Catarina, Rio Grande do Sul and Mato Grosso do Sul (19% of the total federative units) corresponding to 55.10% of the GDP and in the rest of the Federations of the Brazilian States there is no type of Waste/Recyclable Exchange (66% of the total federative units) corresponding to 24.80% of the GDP. Graph 1 below presents a breakdown of the GDPs related to the participation or not of the State Federations in the Integrated Waste System.

Graph 1 – Waste Pocket x GDP



The following are the Insulated Bags and the Integrated System of Waste/Recyclable Bags existing in Brazil.

3.1 INSULATED WASTE POUCH SYSTEMS

With the same objective of buying, selling, exchanging, and donating waste and recyclables but limited to a certain state. The states that have their own system are: São Paulo, Rio de Janeiro, Santa Catarina, Rio Grande do Sul and Mato Grosso do Sul.

3.1.1 São Paulo

In 1990 it started informally, being the Brazilian state with the highest production of waste. To participate in the Waste/Recyclable Exchange of the Federation of Industries of the State of São Paulo (FIESP), it is necessary for the interested company to submit its registration for consideration by the management committee and, only after approval, can it participate in the scholarship. The portal also has a list of service providers related or not to waste generation or collection [9].

As the State of São Paulo represents 31.4% of the Brazilian GDP, it is evident that it has the largest number of registered companies and visitors, as well as advertisements and online users, although this data is not available to those not registered in the system.

3.1.2 Rio de Janeiro

The Waste/Recyclables Exchange of the Federation of Industries of the State of Rio de Janeiro (FIRJAN), created in 2000 in partnership with the State Foundation for Environmental Engineering (FEEMA), is an online space, free and open, for companies to search for and disseminate information about their waste in order to achieve economic gains and reduce environmental impacts. Waste is made available by sector of activity with their respective offers and demands. The website receives about

700 queries monthly. To participate in the Scholarship, it is necessary to register in advance so that the residue can be disclosed. It is probable that its indicators are higher than those of the state of Minas Gerais [5].

3.1.3 Rio Grande do Sul

The main objective of the Waste Bank of the Federation of Industries of Rio Grande do Sul (FIERGS) is to reduce, reuse and recycle industrial waste, seeking to preserve the environment, generate jobs and implement technologically viable projects in the various research departments of the partner universities. In the composition of the Waste Bank there is the Recyclables Exchange in which previously registered companies can buy, exchange, sell and donate waste free of charge, seeking to strengthen and create new opportunities for the recycling sector. On the portal there are more than 10 thousand registered companies and 200 active ads. FIERGS is a very active federation in this area and promotes several lectures, workshops and international forums on solid waste to disseminate its programs and actions and, in 2016, it will have its 7th edition with the participation of several international experts [7].

3.1.4 Santa Catarina

The Waste Exchange of the Federation of Industries of the State of Santa Catarina (FIESC) was founded in 2004 and has the same objective as the other exchanges. It has an electronic portal that aims to identify business opportunities for waste. To participate, it is necessary to register in advance and free of charge, for restricted access (login and password) and currently has 1705 registered companies and 592 active ads [4]. FIESC understands that its scholarship "is an important instrument for the management of waste resulting from productive activities, based on the promotion of a process of free negotiation between waste claimants and suppliers, focusing on reuse or recycling" [8].

3.1.5 Mato Grosso do Sul

With the same objective as the other exchanges, to participate in the Waste Exchange of the Federation of Industries of the State of Mato Grosso do Sul, it is necessary to register in advance with *login* and password to access the exclusive restricted area for companies that are making their waste available. According to SINDVEST-MS, this is a proposal that contributes to the preservation of the environment, through the reduction of waste in nature. Participation is open to Legal Entities, including micro, small, medium, and large enterprises, for all available services of the Program. To register, the company must have waste to participate in the exchange. Companies only interested in acquiring waste should look directly for the companies registered on the exchange's website [6].

3.2 INTEGRATED WASTE BAG SYSTEM (SIBR)

In 2008, the National Confederation of Industries (CNI), which represents and defends the interests of Brazilian industry in the 27 State Federations and in 1250 employers' unions with almost 700 thousand industries before the Executive, Legislative and Judiciary powers, as well as in various entities and organizations in Brazil and abroad, proposed a project to interconnect the Waste/Recyclable Exchanges of all States in a single portal [3]. In 2009, CNI launched a new "on-line" internet system (http://www.sibr.com.br/sibr/index_bolsa.jsp*) with login and* password, which at the time intended to serve 10,000 companies throughout the country, with the objective of standardizing the operations of purchase, sale, exchange and donation of industrial waste among companies throughout the Brazilian territory. The SIBR system, in addition to interconnecting all state units, also avoids waste, reduces environmental impact and brings economic benefits to all users of the system.

According to SIBR/CNI [11], "The main objective of the Integrated system is to strengthen the state stock exchanges, provide standardization in the way they operate and incorporate the best existing experiences in a friendly, modern and safe environment. With the national database, it is intended to give greater scale and visibility to the operations of the exchanges, adding value to the negotiations for reasons of scale and providing greater publicity to the registered advertisements".

Companies legally established in the country, or from other countries, can participate in the Waste Exchanges, as long as they have a legal representative duly authorized to sell waste. Individuals and companies with pending regularization with the Federal Revenue Service [11] cannot participate in the Integrated System.

To enable registration, it is necessary for the participant to provide their National Registry of Legal Entities (CNPJ) and National Registry of Economic Activities (CNAE). After approval, the registration, the participant will be able to participate in the transactions of the exchange that involve registration of the advertisements for sale, purchase, exchange or donation of waste.

Currently, the Integrated Waste Exchange System (SIBR) is composed of four states: Bahia, Minas Gerais, Paraná and Sergipe, and it was found that there was no expected adhesion. Another important issue is that the Waste/Recyclable Bags of the Federations of the States of Espírito Santo, Goiás, Pernambuco and Pará, which were once active in the SIBR system, are now inactive.

In an online consultation on 05/11/2015, the global indicators were 7082 registered companies, with 46 ads, 17 online users and 675258 visitors.

The integration of waste exchanges in a single system allows interested companies to find waste that is closer to their location, even if they are in another state of the Federation. In the case of isolated systems, when accessing the system of its federative unit, a company would only be able to observe offers from companies registered in this isolated system, while if it were in an integrated system, it

could find all the offers of waste, throughout the federation, even making it possible to acquire waste from a company in another state, but geographically closer. Figure 1 below exemplifies this idea: Accessing an isolated system, company "A" would only see waste offers from its state and, therefore, would only see company "B's" offer, however, if it were in an integrated waste exchange system, it could see company "C's" offer, which, although it is in another federation unit, is geographically closer, allowing a more economical and environmentally correct acquisition, by reducing the costs and emissions arising from the transportation of the waste to be acquired, due to the shorter transport distance. Now, if there were an integrated system, in addition to the possibility of increasing the supply of waste, consequently increasing competitiveness, the important aspect of physical location that impacts the possibility of reducing costs and emissions in the transportation of acquired waste is also highlighted.

Figure 1 – Isolated x Integrated System – Physical Location of Waste Exchange Participants



A – Company registered in the FIERGS Waste Exchange
B – Company registered in the FIERGS Waste Exchange
C – Company registered in the FIESC Waste Exchange

4 ADVANTAGES OF INTEGRATED WASTE BAG SYSTEM

The greatest advantage is the creation of a common environment for all Federations, highlighting the standardization, the concentration of data and information in a single national database, allowing the generation of statistics of the transactions carried out and the expectations of demands, allowing the participants to program their actions in a more effective and efficient way.

Another aspect of great importance is the agility in the search for buyers/sellers due to the concentration of data in a single database, which would not be possible if you had to search between several sites individually.

Access is also simplified since the user would have a standardized (unique) interface, avoiding understanding and becoming familiar with other portals.

The registration of waste in a single portal reduces time, speeds up visualization and facilitates the comparison between offers of the same type of waste available.

It is important to highlight the aspects of shortening time, resources and emissions, when it becomes possible to select waste suppliers closer to buyers, due to the integrated system.

5 CONCLUSION

It is evident the need for actions that bring the development of new waste management tools in accordance with the National Waste Policy of August 2010 based on the hierarchy of "avoid, reduce, reuse, recycle and adequate treatment".

The Integrated Waste Exchange System brings greater efficiency in waste management, expanding the universe of interconnections between suppliers/buyers, reducing waste and operating costs, greater environmental responsibility and at the same time bringing better decision-making, resulting in greater competitiveness and the improvement of society's principles and values.

In view of the above, it would be of great importance for the National Confederation of Industry (CNI) to encourage the State Federations to adopt the Integrated Waste Exchange System (SIBR) through events such as meetings, seminars, workshops, etc., presenting all its advantages and benefits.

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REFERENCES

ABRIL. Planeta Sustentável. Disponível em http://planetasustentavel.abril.com.br/noticia/lixo/conteudo_482740.shtml

Câmara Federal. Lei Federal Nº 12.305/2010. Institui a Política Nacional de Resíduos Sólidos; altera a Lei no 9.605, de 12 de fevereiro de 1998; e dá outras providências. Disponível em http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/lei/l12305.htm.

CNI. Disponível em http://www.portaldaindustria.com.br/cni/

Conselho Nacional do Meio Ambiente. Resolução Nº 307/2002. Estabelece diretrizes, critérios e procedimentos para a gestão dos resíduos da construção civil. Disponível em http://www.mma.gov.br/port/conama/res/res02/res30702.html

ECOMARAPENDI. Reciclo teca. Bolsa de Resíduos da FIRJAN. Disponível em http://www.recicloteca.org.br/noticias/voce-ja-conhece-bolsa-de-residuos-da-firjan/.

FIEMS. Bolsa de Resíduos, Disponível em http://www.sindivestms.com.br/index.php?conteudo=canal&canal_id=34

FIERGS. Bolsa de Recicláveis. Disponível em http://www.bolsadereciclaveis.org.br/Inicial

FIESC. Bolsa de Resíduos da FIESC. http://brfiesc.com.br/

FIESP. Bolsa de Resíduos Negócios e Meio Ambiente. Disponível em http://apps.fiesp.com.br/bolsaresiduos/

SENAC – Setor 3. 2008. Disponível em http://www.setor3.com.br/jsp/default.jsp?tab=00002&newsID=a4392.htm&subTab=00000&uf=&local=&testeira=33&l=&template=58.dwt&unit=&sectid=186&leiamais=4434

SIBR. Disponível em http://www.sibr.com.br/sibr/index_cni.jsp

SEVEN publicações acadêmicas

The importance of monitoring in remote teaching: Experiences of a nursing student in the collaborative teaching-learning process in academic training

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ABSTRACT

This is an experience report of a quantitative descriptive approach about the performance of the Monitor's Integrated Monitoring project of the Department of Cell Biology and Genetics (MIC-DBG) of UFRN during Emergency Remote Teaching in the pandemic caused by SARS CoV-2. The Monitoring actions were developed with Ecology, Nursing, Dentistry and Pharmacy students, assisting the teachers of 03 classes of Cellular and Molecular Biology and 01 class of Genetics, making a population of 102 students. The use of TDICs in synchronous and asynchronous actions was of relevant importance for both students and professors, and none of them had sufficient skills and competencies to face higher education in the ERE condition as a strategy for continuing the general activities of the global population. The limitations and restrictions were not the same for the actors of the teacher-student teaching process and, consequently, for the Monitor. The results of the Monitor's actions were successful both with Cellular and Molecular Biology classes and with the Genetics class, where the use of Instagram and Whatsapp was the main communication link. The actions included group discussions, holding scavenger hunts through Instagram, providing didactic material, solving exercises discussed remotely, and also using virtual laboratories, online simulators, animations and games of biocellular processes, culminating with the unique opportunity that Monitoring provides, that of teaching a theoretical class supervised by the teacher. There was good adherence of the students with participation in the discussions and search for monitoring to remove doubts individually with preferential use of messaging applications (insert the numbers %). Reports from the students in the groups (67%) point to TDICs as great strategies for a greater assimilation of the content, as well as an improvement in the performance of the evaluations due to the contribution of the monitor. In this report of the experiences of a Bachelor's Degree in Nursing student as an Integrated Monitor, it is noted that, although the challenges experienced during the pandemic have affected the population in several instances, and in education it was no different, the possibilities with new technologies in line with synchronous and asynchronous remote teaching, it was possible to reap good results during the Emergency Remote Teaching (ERE), which contributed so much to the maturation and strengthening of the student triad - Integrated Monitor – Teacher.

Keywords: Remote teaching, Monitoring, TDCIs, Social Networks.

1 INTRODUCTION

The Continuous Integrated Monitoring Project of the Department of Cell Biology and Genetics (MIC-DBG), of the Biosciences Center, of the Federal University of Rio Grande do Norte (UFRN) began in 2014.The integration of monitoring is the result of the understanding that interdisciplinarity

is a fundamental part in the production and socialization of knowledge in the area of education, since thinking becomes multidimensional and as a consequence favors the organization of information. Overcoming knowledge fragmentation (Thiesen, 2023).

The demand for integrated monitoring meets the profile of the DBG since the Department attends seventeen (17) undergraduate courses, offering Curricular Components (CC) of Genetics and Cellular and Molecular Biology, and each semester between thirty and thirty-three (30 and 33) classes are created with approximately 740 students. Over the years, MIC-DBG has selected 47 scholarship holders and 44 volunteer integrated monitors and has served approximately 3400 students in more than 180 undergraduate classes (on average with 35 students) with monitors (not including attendance for students in classes without monitors).

The integrated monitoring of the DBG selects students from the undergraduate courses at UFRN, which requires *the* approval of the student in both curricular components of Genetics and Cellular and Molecular Biology. In this way, the Integrated Monitor is able to act and assist, simultaneously, an undergraduate class with the Genetics component and another with Cellular and Molecular Biology. In addition, each semester the Monitor interacts with different classes, undergraduate courses, teachers, methodologies and didactics, helping with the mutual exchange of knowledge and interdicisplinarity that expands even outside the classroom (BLAHA et al., 2014).

On March 11, 2020, the World Health Organization declared a worldwide pandemic caused by the novel coronavirus (COVID-19), severe acute respiratory syndrome 2 (SARS-CoV-2). The disease began in Wuhan, China, and within two weeks of the virus circulating, the number of confirmed cases increased 13-fold outside China and three-fold in other countries(Cucinotta and Vanelli. 2020). The ease of viral spread and the pandemic state of emergency caused the whole world to enter into social isolation, until in-depth studies on the virus, form of transmission, characteristics of the disease and treatment could reach the community, and the community learned to readjust its daily activities.

Not differently, education has undergone transformations never experienced before due to this scenario. The pandemic has affected nearly 1.6 billion students in more than 190 countries and on every continent of the globe. This has prompted the United Nations (UN) to show its main concerns about the possible impacts of this outbreak on education. In its understandings, the UN emphasized that education, in addition to being a human right, is an enabler with a direct impact on other human rights. As such, it was up to the world to rethink and reimagine education with ways to accelerate and change the teaching and learning of that moment(By Giusti2020).

In this urgent global scenario, conditioned by COVID-19, supported by Resolution No. 062/2020-CONSEPE, of November 5, 2020, the Emergency Remote Teaching (ERE) format is instituted in UFRN's teaching activities to meet this gap. Unlike distance learning (EAD) in which the teaching team is already trained, with platforms completely adapted to this format, the pandemic

imposed a new reality on educational institutions: teaching remotely, encouraging teachers and students to adapt without presenting a standardization in the form of activities, resources used, and classes.

Since then, several challenges have been faced, both by the teacher and the student, to meet this transition period. Teachers needed to reinvent themselves from a form of teaching that was fully face-to-face, in the classroom, to virtual classes, without the previous pedagogical and technological improvement, which were acquired by distance education. Added to this are the difficulties with the information technology (IT) infrastructure of educational institutions. It is important to mention that remote teaching not only requires the use of ICTs, but also the use of other resources such as printing papers, books, group work that facilitate the assimilation of content (CLEMENTINO et al., 2021, MACHADO et al., 2022). For the students, but not very differently for the teachers, many of the difficulties faced were the limitations for internet access, availability of electronic equipment, as well as the organization of their study routine within their family life, adding to this, the emotional instability in which that moment brought, as reported by Lima et al (2020), Tulaskar and Turunen (2021), Juliani et al (2022), and Santos et al (2022).

According to Lobo and Maia (2015), the face-to-face teaching-learning process tends to be more enriching to the extent that the student is led to learn by doing, that is, by having active participation with the use of TDCIs in classroom activities. In this way, the student's contribution as a central link in the classroom allows for a faster exchange of information between students and the monitor/teacher. The purely expository class then gives way to the active role of the student, in which he will be led and taught to seek information, which makes him a fundamental part in the search for knowledge. The study conducted by Leka and Grinkraut (2014) reports that students often find themselves trapped in an unattractive environment in the face-to-face classroom, linked to the methodology applied by the teacher. The use of social networks, also covered in this study, seems to be a pleasant environment for students, where they can communicate with their classmates in a more interactive way. The new pandemic scenario has opened up new ranges in terms of the way of teaching, taking advantage of active methodologies that were already applied in the face-to-face classroom, but which now become excellence in the remote environment (MACIEL et al., 2020MACHADO et al., 2022, DOS SANTOS et al., 2022).

Therefore, this Remote Monitoring report aims to report the experiences and actions implemented by the Bachelor of Nursing student as an Integrated Monitor in the semester of 2021.1, assisting in the Teaching-Learning process of Genetics and Cellular and Molecular Biology of the DBG, in the middle of the pandemic period.

2 MATERIALS AND METHODS

This is an experience report with a quantitative descriptive approach of the experiences and actions implemented by the Monitor advising students of the Bachelor's Degree courses in Ecology, Nursing, Pharmacy and Dentistry during the 1st Semester of 2021. This semester, the monitor served 25 students from the Bachelor's Degree in Ecology, 24 students from the Bachelor's Degree in Nursing, 40 students from the Bachelor's Degree in Pharmacy and 13 students from the Bachelor's Degree in Dentistry, with 4 professors along with the integrative work of learning. The TDCIs were adopted as a teaching strategy for the activities/actions in both synchronous and asynchronous modalities of the ERE: i) GoogleMEET® Platform, ii) Kahoot® Platform, iii) UFRN Academic Activities Management System – SIGAA eiv) Media/Social Networks.The applications of these tools happened as described:I) communication through WhatsApp® groups;II) monitoring of virtual classes via SIGAA; III) production of explanatory videos; IV) creation of polls through the Monitoria's Instagram®, in which the content of the unit was exercised; V) production of mind maps and explanatory text on Instagram®.

To evaluate the students' perception of the monitor's performance and the virtual tools applied, three surveys were conducted through the SIGAA of each of the classes, containing the following questions: A) "how do you evaluate the monitor's performance during the remote period?" B) "What is your assessment of the use of TDCIs chosen by the MIC-DBG project (WhatsApp®, Instagram®, Google Meet®, Kahoot®)?" C) "In your opinion, did the teaching strategies used help you to improve academic performance in the subjects covered by the project?". The first and second questions (A and B) could be answered as "excellent", "good", "fair", "bad" or "very bad"; the third (C) would have "yes" or "no" answers.

3 RESULTS AND DISCUSSION

Technical skills with theoretical depth provide the academic improvement of monitoring, key elements that undergo constant adaptations. With the COVID-19 pandemic, new configurations of the MIC-DBG Project became necessary, face-to-face actions were adapted to the urgent and unexpected mode of Emergency Remote Teaching (ERE) in order to continue helping the actors involved in the Teaching-Learning process (CLEMENTINO et al., 2021, MACHADO et al., 2022). The experiences of remote teaching and the performance of the Monitor occurred during the 2nd academic semester of 2021 at UFRN, resulting in actions developed with the consent of each of the four (04) professors responsible for the CCs of Genetics and Cell Biology (Table 1).

Table 1 Curricular Components and ERE Classes in the 1st semester 2021

CURRICULAR COMPONENT/COURSE	STUDENTS
DBG0052 - Cell Biology for Ecology – Bachelor of Science in Ecology	25 (1st Period)
DBG0071 - Biology and Ecology - Bachelor of Science in Nursing	24 (1st Period)
DBG0014 - Genetics - Bachelor of Pharmacy	40 (1st Period)
DBG0142 - Genetics VII - Bachelor of Dentistry	13 (2nd Period)

Table 1: Distribution of the number of students served by CC and undergraduate course. Source: Author.

The students enrolled in CCsDBG0052, DBG0071 and DBG0014 are freshmen, coming from High School who have already transited and continued their studies in the ERE mode when entering higher education. Except for students in class DBG0014 who have already attended the CC DBG0003 Cellular and Molecular Biology remotely in the previous semester. However, all of them had new challenges in the "home-office" environment, that is, few or no Professors, Monitors and/or Students were prepared to overcome the various restrictions and challenges imposed by the Pandemic, which were impactful, both globally (TULASKAR AND TURUNEN, 2021) and here, in Brazil (LIMA et al., 2020, JULIANI et al., 2022 and SANTOS et al., 2022).

The online platforms Google®, Kahoot®, Youtube® and Social Networks such as WhatsApp®, Instagram® and SIGAA (UFRN) facilitated interaction and increased collaboration in the educational environmentwith the actions developed by the Monitor during the second half of 2021 **(Table 2).** Among the actions performed, those used in synchronous and asynchronous format stand out, in addition to the monitor's dedication workload throughout this period. All activities were carried out to accompany the Genetics class and the Cell Biology class, simultaneously: this is the differential feature of the Continuous Integrated Monitoring project of DBG/UFRN in Face-to-Face Teaching (BLAHA et al., 2014), which integrates knowledge in two major areas of knowledge, today adapted to ERE.

Table 2: Actions developed and dedication of time/class by the Monitor in synchronous and asynchronous modality in the semester of 2021.2.

ACTIVITIES/ACTIONS	
	Dedication
Synchronous Mode	
Follow-up of the theoretical class	36 Class Hours (Cell Biology) 56 hours/classroom (Genetics)
Classes: Follow-up of Simulated Practical Classes	4 Hours/class (Cell Biology)
Teach a Theoretical Class Supervised by the teacher for the Bachelor's Degree in Dentistry class	02 class hours (Cellular and Molecular Biology)
Asynchronous Mode	
On-call for questions using WhatsApp;	20 class hours (Cell Biology) 56 hours/classroom (Genetics)
Assistance to the teacher in the correction of evaluations	6h (Cell Biology for Ecology)

Tutoring is the gateway to experiences for university teaching. Once monitored, the student starts to manage his time around his own routine activities, in addition to relating his training to the demands of monitoring. This demands a high workload of dedication in addition to skills in the

handling of TDICs regarding the knowledge and skills/competencies for their performance in Remote Monitoring, which is worth emphasizing, no less challenging than Face-to-Face Monitoring (DANTAS, 2014; FRISON, 2016). The dedication (workload) of the Monitor to monitor the synchronous activities is very important. In situations such as the one experienced by the Monitor, for example, being an academic of the Bachelor of Nursing course who develops his actions as a Monitor with the Genetics class for the Bachelor of Dentistry, he demanded a greater workload for his monitoring, considering that the content of Genetics for Dentistry has approaches specific to the area, which meet the Pedagogical Project of the Dentistry course at UFRN, different from the Genetics CC attended by the Monitor himself (**Table 2**).

Thinking about practical classes, whether with basic or professional content, is another challenge with a great impact on university education, and no less important. Thinking about adaptations of practical classes for the ERE period directly reflects on the Monitor's demand for action (**Table 2**). Studies described by Clementino et al., (2021); Machado et al., (2022) and Amorin and Mercado (2022) evidenced the constant searches and motivations in remote practical classes in the teaching activity, in this ERE period. The search for remote practices tried to minimize impacts to the detriment of face-to-face practical classes that could not be performed in the emergency period of the pandemic caused by the SARSCOV2. Such challenges were also described with regard to new experiences lived by students (LIMA et al., 2020, JULIANI et al., 2022 and SANTOS et al., 2022). Virtual tools with: laboratories, online simulators (https://www.ncbionetwork.org/iet/microscope/; https://myscope-explore.org/virtualSEM_explore.html), videos of molecular cellular simulations and processes and computational animations (https://dnalc.cshl.edu/resources/animations/) and games (https://www.nobelprize.org/educational/, have become the preferences to meet the demand of practical classes in remote times in order to allow a better understanding and fixation of the concepts and learning addressed in the remote classroom, so that the impact on the learning did not take on a more critical dimension than it already was.

Considering that "learning refers to the acquisition of a particular response, learned as a result of the experience obtained systematically or not" (PIAGET, 1975) and also that "the teaching process is a complex social practice carried out between the subjects, teacher and student, encompassing both the action of teaching and that of learning", ANASTASIOU, 1997), the various teaching activities developed in the ERE in the asynchronous modality also reserve a very important role for the Monitor.

Thus, we can observe from the workload invested by the Monitor that the students interacted using social networks, particularly through WhatsApp® and Instagram®, promoting communication, rapport and agility in the exchange of knowledge in a Student-Monitor relationship, but also between Professors-Students-Monitors(**Table 2**). It is important to highlight that in this workload it is not discriminated to which course we belong students who compete for the "on-call-answer-questions"

using WhatsApp® and in the same way, those who enjoy the explanatory videos produced on subjects in which students have more difficulties and that require help. Also, in this workload of interaction between the monitor and the student, it is included the choice and sharing of scientific articles, books, academic websites, videos with animations and computer simulations available on Youtube®. The resolution of lists of exercises sent by the teachers using GOOGLE MEET®(i), the virtual scavenger hunts through Instagram of the monitoring for the training of students (ii) and the gamified reviews with the use of Kahoot!®(iii), were developed in agreement with the teachers of these CCs. Particularly, it should be noted that they represented relevance for the academic training of the Monitor who, in its nature as an Integrated Monitor, it has the opportunity to move through the contents of Genetics and Cell Biology to different courses (Table 2).

The Monitor's contribution to the content fixation process, assisting in the acquisition of new skills and abilities, has been proven by several authors in the face-to-face teaching modality (NUNES, 2007; DANTAS, 2014; BLAHA et al., 2014; FRISON, 2016) and demonstrated during the ERE period (CAVALCANTE e SILVA 2022, DA SILVA et al., 2022; DE MACEDO JUNIOR et al., 2022 FERNANDES et al., 2022 DE OLIVEIRA ROCHA et al., 2022). Of the 102 students enrolled in the CCs, 79 are part of the WhatsApp®groups and, therefore, had the ability to access and interact with the Monitor and consequently with the teacher (although some of them did not participate in the groups). It is not possible to pinpoint exactly the reasons why the rest of the students did not participate in the groups, but the pandemic impacted the students in some way, unlike the professors in the ERE (LIMA et al., 2020, JULIANI et al., 2022 and SANTOS et al., 2022).

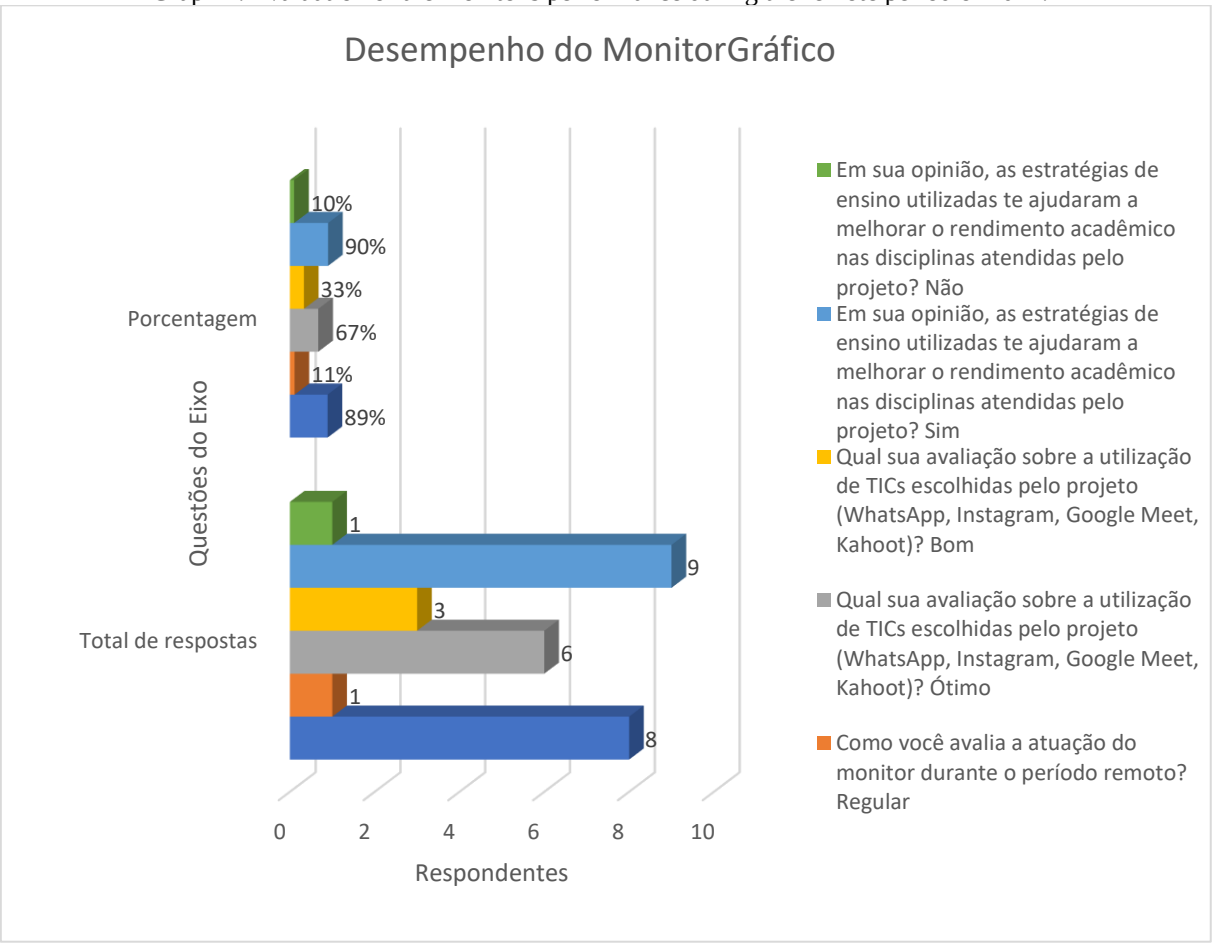
A study carried out by the Institute of Applied Economic Research (Ipea) and home access to the internet emphasized the difficulty of remote teaching, especially in elementary school students from public institutions, where it showed that 1.91 million students did not have home access to 3G/4G broadband internet, not even to resources such as phones, smartphones and even computers. Many families had only one telephone for everyone in the household. This number was not so impactful among undergraduate students during the pandemic, but about 51 to 72 thousand undergraduate students from public educational institutions also did not have access to the internet (IPEA, 2020). The Integrated Academic Activities Management System (SIGAA), a web platform created by the Superintendence of Informatics of UFRN (UFRN, 2022), is also required to have an internet connection in order to access the platform. Although there is a SIGAA app for smartphones, it depends on the internet connection and other minimum requirements on the device. Connectivity limitations and other exclusionary problems of students in the ERE were also assessed by (LIMA et al., 2020, TULASKAR AND TURUNEN, 2021, JULIANI et al., 2022 and SANTOS et al., 2022).

No less important than the resources of internet access, the affective state regarding emotions, stress responses and the cognitive aspect walked together in the learning process and, the COVID-19

pandemic left a bottleneck between the emotion axis and the way of coping with this scenario, based on the lack of motivation regarding studies, difficulty in the management routine at home and even the search for jobs to help with household expenses, these are points that should also be taken into account regarding students' lack of access to ICTs (MIRANDA et al., 2020).In this sense, even so, it is understood that monitoring in remote teaching was extremely valuable to rescue the confidence, performance and interest of students in the curricular components attended and monitored by the monitor.

In order to evaluate the Monitor's performance, three surveys were conducted via SIGAA to assess students' perception of the Monitor's performance, the strategies used, and the overall benefit of Monitoring throughout the 2021 semester.2 (**Chart 1**).

Graph 1. Evaluation of the monitor's performance during the remote period of 2021.2



Source: Author

The results obtained regarding the evaluation of the monitor by the students were not what was expected in relation to the number of students who answered the questions in the survey, but as for those who adhered to the questions in relation to the performance of the monitors during the pandemic period, 89% (8) perceived the performance to be excellent compared to 11% (1) with regular

performance; 67% (6) found the use of ICTs to be great strategies to help with remote teaching compared to 33% (3) of students who found the tools good during this period.

From the variety of synchronous and asynchronous actions and activities developed by the Monitor working in these classes and the investment in workload for each of them, it can be deduced that the reduced number of respondents (Table 2) obeys, in addition to those mentioned above, other reasons among which we can mention: i) the visible difference in friendly handling and intuitive interaction through WhatsApp® and/or Instagram® (greater number of respondents); ii) the need to log in to SIGAA with several steps to reach the place where the survey is listed, steps that can be discouraging (reduced number of students when compared to the total number of students/class) (Graph 1).

The strategies and tools used allowed for better engagement, in addition to bringing teachers, monitors, and students closer together in a situation of isolation. Thus, the data demonstrate a satisfactory performance, since there was significant acceptance of the teaching strategies used by the project monitor. In addition, it can be seen that the TDICs used for the development of the activities were very well received by the students, with all the participants of the surveys evaluating the choices as excellent or good. Also noteworthy is the expressive opinion of students who affirm that the Monitoring helped them to improve their performance. This fact demonstrates the importance of the MIC-9.0 Project for the greater academic success of students associated with the interactive practices of TDICs (WhatsApp, Instagram, Google Meet, Kahoot!, etc.), as also shown in the study conducted by Toma et al., (2021), carried out at MihaiEminescu" National College, Bucharest/Romania, with the use of activity practices with Kahoot! as a way of evaluating the learning of online classes during the pandemic period, encouraging them to play an active role in the lesson.

Among the actions and activities developed by the Monitor, two moments can be experienced as the maximum of the experiences on the path of his professional training as a future Teacher: *teaching class and* correcting the test exclusively and supervised by the teacher. Under the supervision of the CC Professor DBG0052 Cell Biology for Ecology, the Monitor participated in the process of correcting tests. He also taught a synchronous Theoretical Class "Death Celular_Necrose-and-apoptosis" at the CC DBG0003*Cellular and Molecular Biology* for the Bachelor's Degree in Dentistry (Figure 1a; b).

Figure 1-a. Image of the title of the lecture

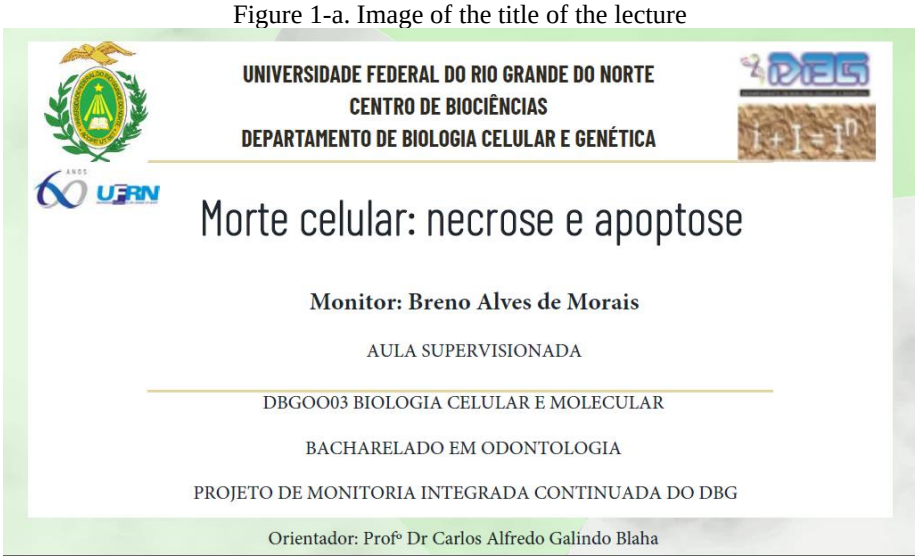
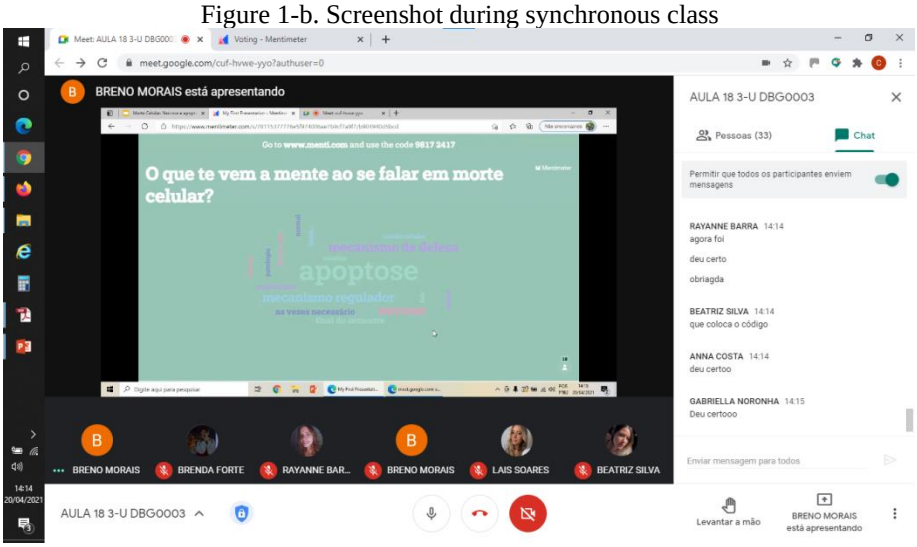


Figure 1-b. Screenshot during synchronous class



The technological aptitudes as well as the knowledge and skills/competencies of the Monitor, both in face-to-face teaching (DANTAS, 2014; FRISON, 2016) are put to the test when they are encouraged to teach a class in Remote Monitoring, which is no less challenging than Face-to-Face Monitoring. Nunes (2007) and Anastasiou (2013) advocate that the class supervised by the teacher can be considered the summit of the Monitor's experience, reaching the main objective of Monitoring, the Initiation to Teaching.

4 FINAL THOUGHTS

Supported by Law No. 5540 of November 28, 1968 and reinforced by Law No. 9,394 of December 20, 1996, UFRN through several resolutions establishes standards for Teaching Programs and Projects, including the Monitoring Program.

The learning process in Piaget's (1975) vision or in the Teaching Process in the vision (Anastasiou, (1997) Freire's words (2001):

> "The learning of the teacher when teaching does not necessarily take place through the rectification that the learner makes of mistakes made. The learning of the teacher in teaching is verified to the extent that the teacher, humble, open, is permanently available to rethink what he thinks, to see himself in his positions; in which she seeks to engage with the curiosity of the students and the different paths and paths that she takes them on."

Illustrate the challenge of the Teacher, the Monitor and the Student both in the pandemic Emergency Remote Teaching and in Face-to-Face Teaching.

In this report of the experiences of a Bachelor of Nursing student as an Integrated Monitor, it is noted that, although great challenges were faced at the time of the COVID-19 Pandemic, it was and still is possible to reap good personal and professional fruits for the future. TDICs have a lot to offer, and we must make use of them to increasingly improve the quality of teaching, making it more attractive and accessible to students. It is evident that MONITORING contributes to UFRN meeting the UN's Sustainable Development Goals, the 2030 Agenda for Sustainable Development", which is "Quality Education" (Goal 4) in a time that sustains public, free and quality education.

REFERENCES

Agenda 2030. 2015. Traduzido pelo Centro de Informação das Nações Unidas para o Brasil (UNIC Rio), última edição em 13 de outubro de 2015. Disponível em: <https://nacoesunidas.org/pos2015/agenda2030/>. Acesso em: 19 set. 2019.

AMORIM, D. C. de; MERCADO, L. P. L. Desafios de dois professores de Biologia Celular e Molecular na pandemia da covid-19: do ensino às práticas laboratoriais. Revista Docência do Ensino Superior, Belo Horizonte, v. 12, p. 1–20, 2022. DOI: 10.35699/2237-5864.2022.38368. Disponível em: https://periodicos.ufmg.br/index.php/rdes/article/view/38368. Acesso em: 19 dez. 2022.

ANASTASIOU, Léa das Graças Camargos. Ensinar, aprender, apreender e processos de ensinagem. Processos de ensinagem na universidade: pressupostos para as estratégias de trabalho em aula, v. 7, p. 15-43, 2003

ANASTASIOU, Lea das GracasCamargos. Metodologia do/no ensino superior: da pratica docente a uma possível teoria pedagógica. 1997. Tese (Doutorado) – Universidade de São Paulo, São Paulo, 1997. Acesso em: 15 out. 2022.

AZEVEDO, M. M. R. et al.Kahoot as a ludic strategy in the teaching-learning of Cellular Biology . Research, Society and Development, [S. l.], v. 10, n. 12, p. e159101219049, 2021. DOI: 10.33448/rsd-v10i12.19049. Disponível em: https://rsdjournal.org/index.php/rsd/article/view/19049. Acesso em: 13 oct. 2021.

BLAHA, C. A. G.; SOARES, I. C. DOS S.; ARAUJO, A. M. M. DE ; PEREIRA, A. C. L. Monitoria integrada como estratégia para melhoria da ensinagemde Genética e de Biologia Celular e Molecular na UFRN. V Encontro Nacional das Licenciaturas (ENALIC) e o IV Seminário Nacional do Pibid, UFRN, 8-12 dezembro de 2014, Natal-RN, Brasil.

“Biogene” no Instagram instagram.com/biogene_ufrn

BRASIL, LEI Nº 5.540, DE 28 DE NOVEMBRO DE 1968, Diário Oficial da União - Seção 1 - 29/11/1968, Página 10369 (Publicação Original) Coleção de Leis do Brasil - 1968, Página 152 Vol. 7 Brasil. Presidência da República.

BRASIL, Lei no 9.394, de 20 de dezembro de 1996. Estabelece as diretrizes e bases da educação nacional. [Internet]. 1996.

BRASIL. Ministério da Saúde. O que é a Covid-19?.2021. Disponível em:https://www.gov.br/saude/pt-br/coronavirus/o-que-e-o-coronavirus. Acesso em: 12 out. 2021.

CAVALCANTE, A. A.; SILVA, C. L. de A. Contribuições da monitoria acadêmica na disciplina de anatomia dos sistemas orgânicos para o processo de ensino-aprendizagem em período pandêmico da Covid- 19: um relato de experiência / Contributionsofacademicmonitoring in thesubjectofanatomyoforganic systems totheteaching-learningprocess in thepandemicperiodat Covid-19: anexperience report. Brazilian Journal of Development, [S. l.], v. 8, n. 4, p. 24629–24637, 2022. DOI: 10.34117/bjdv8n4-127. Disponível em: https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/46181. Acesso em: 20 dec. 2022.

CLEMENTINO, A.; SOUZA, C. C. M.; HITO, S. C. Planejamento didático no ensino remoto: ênfase nas estratégias pedagógicas e o relato de experiência de uma instituição de ensino superior / Didacticplanning in remoteteaching: emphasisonpedagogicalstrategiesandtheexperiencereportof a highereducationinstitution. Brazilian Journal of Development, [S. l.], v. 7, n. 8, p. 78904–78917, 2021.

DOI: 10.34117/bjdv7n8-215. Disponível em: https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/34182. Acesso em: 20 dec. 2022.

CUCINOTTA D, Vanelli M. WHO Declares COVID-19 a Pandemic. Acta Biomed [Internet]. 2020 [cited 2023 Mar 27];91(1):157–60. Availablefrom: https://pubmed.ncbi.nlm.nih.gov/32191675/

DA COSTA SILVA, Murilo Gabriel et al. Monitoria em tempos de pandemia: lições e práticas de professores e monitores no curso de graduação em administração em uma universidade pública. Revista Gestão Universitária na América Latina-GUAL, v. 15, n. 2, p. 133-157, 2022.

DANTAS, O. M. Monitoria: fonte de saberes à docência superior. Revista Brasileira de Estudos Pedagógicos. Brasília, v. 95, n. 241, p. 567-589, set./dez. 2014. DOI: http://dx.doi.org/10.1590/S2176-6681/301611386

DA SILVA, R. T.; FREIRE, D. P. S.; HOLANDA, R. A. F.; DE SOUSA, G. A. O desafio da monitoria na adaptação de aula remota no ensino de doenças do sistema gastrointestinal e coloproctologia: um relato de experiência / The challengeofmonitoringtheadaptationofremotelectures in theteachingofdiseasesofthe gastrointestinal system andcoloproctology: anexperience report. Brazilian Journal of Development, [S. l.], v. 8, n. 4, p. 22982–22987, 2022. DOI: 10.34117/bjdv8n4-015. Disponível em: https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/45939. Acessoem: 20 dec. 2022.

DE GIUSTI A. PolicPy Brief: Education during COVID-19 and beyond. RevIberoamTecnolenEduc y Educen Tecnol.;(26):e12. 2020

DOS SANTOS, C. S.; LOPES, A. L. de S. O aluno no Ensino Superior: o que a pandemia da COVID-19 revelou sobre sua experiência de aprendizagem contextos virtuais / The student in HigherEducation: whatthe COVID-19 pandemicrevealedabouttheirlearningexperience virtual contexts. Brazilian Journal of Development, [S. l.], v. 8, n. 1, p. 5687–5697, 2022. DOI: 10.34117/bjdv8n1-385. Disponível em: https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/43061. Acesso em: 20 dec. 2022.

FERNANDES, A. P. M.; GAZZOLA, J. M.; CALDAS, V. V. de A. Monitoria em introdução a tecnologia assistiva: ampliando o processo de aprendizagem sobre as inovações tecnológicas / Monitoring in introductiontoassistivetechnology: expandingthelearningprocessabouttechnologicalinnovations. Brazilian Journal of Development, [S. l.], v. 8, n. 4, p. 27029–27035, 2022. DOI: 10.34117/bjdv8n4-284. Disponível em: https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/46561. Acesso em: 20 dec. 2022.

FREIRE, P. Cartas de Paulo Freire aos professores. Estudos Avançados, v.15, n.42, p.259-268, 2001

FRISON, L. M. B. Monitoria: uma modalidade de ensino que potencializa a aprendizagem colaborativa e autorregulada. Pro-posições. Pelotas, v. 27, n. 1, p. 133-153, jan./abr. 2016. DOI: https://doi.org/10.1590/0103-7307201607908

IPEA. (2020) - Nota técnica. 2020. www.ipea.gov.br/portal/images/stories/PDFs/nota_tecnica/200902_nt_disoc_n_88.pdf

JULIANI, L. M.; VICENTINI, B. S.; JULIANI, C. D. O.; BERNARDES, L. J. F. O ensino remoto emergencial em curso de engenharia de produção: perspectiva de estudantes / The emergencyremoteteaching in a productionengineeringcourse: students' perspective. Brazilian Journal of Development, [S. l.], v. 8, n. 1, p. 4901–4916, 2022. DOI: 10.34117/bjdv8n1-325. Disponível em: https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/42900. Acesso em: 20 dec. 2022.

JÚNIOR, A. F. de M.; MARQUES, B. L. M.; MELLO, C. S. A. da C.; BARROCA, I. C. P.; DA SILVA, R. N.; DA SILVEIRA, I. A.; DE ABRANTES, M. R.; DANTAS, D. de S. Monitoria em microbiologia clínica: um momento de oportunidade e promoção de uma educação interativa / Monitoring in clinicalmicrobiology: a momentofopportunityandpromotionofaninteractiveeducation. Brazilian Journal of Development, [S. l.], v. 8, n. 3, p. 21238–21245, 2022. DOI: 10.34117/bjdv8n3-364. Disponível em: https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/45695. Acesso em: 20 dec. 2022.

LEKA, A. R., GRINKRAUT, M. L. A utilização das redes sociais na educação superior. Revista Primus Vitam, n. 7, p. 1-12. 2014. Disponível em: http://delphos-gp.com/primus_vitam/primus_7/aline.pdf. Acesso em: 21 out. 2020.

LIMA, A. C. et al. Desafios da aprendizagem remota por estudantes universitários no contexto da Covid-19. REVISA. 2020; 9(Esp.1): 610-7. DOI: https://doi.org/10.36239/revisa.v9.nesp1.p610a617. Disponível em: http://revistafacesa.senaaires.com.br/index.php/revisa/article/view/615/515. Acesso em: 19 de out. 2021

LOBO, Alex Sander Miranda; MAIA, Luiz Cláudio Gomes. O uso das TICs como ferramenta de ensino-aprendizagem no Ensino Superior. Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, v. 25, n. 44, p. 16-26, jul. 2015. Disponível em: https://www.redalyc.org/pdf/3332/333239878002.pdf. Acesso em: 22 out. 2020.

MACIEL, M. de A. C.; ANDRETO, L. M.; FERREIRA, T. C. M.; MONGIOVI, V. G.; FIGUEIRA, M. C. dos S.; SILVA, S. L. da; SANTOS, C. S. dos; FERREIRA, L. de L. Os desafios do uso de metodologias ativas no ensino remoto durante a pandemia do covid-19 em um curso superior de enfermagem: um relato de experiência / The challengesofusingactivemethodologies in remoteteachingduringthe covid-19 pandemic in a highernursingcourse: anexperience report. Brazilian Journal of Development, [S. l.], v. 6, n. 12, p. 98489–98504, 2020. DOI: 10.34117/bjdv6n12-367. Disponível em: https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/21648. Acesso em: 20 dec. 2022.

MACHADO, Álvaro L.; SANTOS, C. C. M.; LESSA, D. de S.; COUTINHO, M. L. A.; SANTOS, R. A. C.; CORREIA, S. L. A. Desafios e possibilidades no desenvolvimento de competências digitais: relatos de professores: Challengesandpossiblities in thedevelopmentof digital competences :teacher'saccounts. Brazilian Journal of Development, [S. l.], v. 8, n. 8, p. 57967–57993, 2022. DOI: 10.34117/bjdv8n8-203. Disponível em: https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/51277. Acesso em: 20 dec. 2022.

MIRANDA, C. A. G. R., DA ROSA, P. C., DOS SANTOS, C. B., DE JESUS, A. C. Emotionalimpactsofthe Covid-19 pandemiconacademiclearningfromuniversitystudents. Currículo & Docência Vol.2 | Nº 3 | 5-26 Ano 2020.

NUNES, J.B.C., 2007. Monitoria acadêmica: espaço de formação. A monitoria como espaço de iniciação à docência: possibilidades e trajetórias. Natal: EDUFRN, pp.45-58.

PIAGET, Jean. A construção do conhecimento. São Paulo: Secretaria de Estado da Educação. Coordenadoria de Estudos e Normas Pedagógicas, 1987.

RIBEIRO, Júlia Maria Gomes. Utilização de plataformas, mídias e redes sociais por docentes de Ciências Contábeis das universidades federais brasileiras. 2022. 22 f. Trabalho de Conclusão de Curso (Graduação em Ciências Contábeis) - Universidade Federal de Uberlândia, Ituiutaba, 2022. https://repositorio.ufu.br/handle/123456789/34739

RIO GRANDE DO NORTE, Decreto Estadual Nº 29.524, de 17 de março de 2020. Dispõe sobre medidas temporárias para o enfrentamento da situação de Emergência em Saúde Pública provocada pelo novo Coronavírus (COVID-19). Diário Oficial do Rio Grande do Norte: Natal, RN, n.14622, 18 mar. 2020.

ROCHA, B. C. de O.; SILVEIRA, S. S. D. da; MORAES, R. L. de; MONIZ, M. de A.; SÁ, N. S. dos S. de; SILVA, L. R. da; LIMA, L. F. P.; VIANA, E. Monitoria e grupo PET enfermagem: desafios e perspectivas no período pandêmico e pós-pandêmico: Monitoringand PET nursinggroup: challengesand perspectives in thepandemicand post-pandemicperiod. Brazilian Journal of Development, [S. l.], v. 8, n. 11, p. 72333–72347, 2022. DOI: 10.34117/bjdv8n11-103. Disponível em: https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/54026. Acesso em: 20 dec. 2022.

SILVA, G. L. da; RODRIGUES, N. P.; MOURA, S. M. de. Os desafios do uso de metodologias ativas no ensino remoto durante a pandemia do Coronavírus em disciplinas de saúde coletiva de um curso de graduação em odontologia: relato de experiência / The challengesofusingactivemethodologies in remoteteachingduringtheCoronaviruspandemy in collectivehealthsubjectsofanundergraduatecourse in dentistry: anexperience report. Brazilian Journal of Development, [S. l.], v. 8, n. 3, p. 21061–21078, 2022. DOI: 10.34117/bjdv8n3-351. Disponível em: https://ojs.brazilianjournals.com.br/ojs/index.php/BRJD/article/view/45666. Acesso em: 20 dec. 2022.

THIESEN J da S. A interdisciplinaridade como um movimento articulador no processo ensino-aprendizagem. Rev Bras Educ [Internet]. 2008 [cited 2023 Mar 24];13(39):545–54. Available from: http://www.scielo.br/j/rbedu/a/swDcnzst9SVpJvpx6tGYmFr/

TOMA F, DIACONU DC, POPESCU CM. The Use of the Kahoot! Learning Platform as a Type of Formative Assessment in the Context of Pre-University Education during the COVID-19 Pandemic Period. Education Sciences. 2021; 11(10):649. https://doi.org/10.3390/educsci11100649

TULASKAR, R., TURUNEN, M. What students want? Experiences, challenges, and engagement during Emergency Remote Learning amidst COVID-19 crisis. EducInfTechnol 27, 551–587 (2022). https://doi.org/10.1007/s10639-021-10747-1

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Youtube tutorial videos on developing math competencies in high school students: A theoretical review

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ABSTRACT

Education is one of the substantial factors for the development of a country, this will be achieved if the educational actors promote educational actions in order to raise the level of development of mathematical competences and consequently the improvement of the teaching-learning processes in the educational institutions; For this reason, from an innovative perspective, it is necessary to implement technological resources in the pedagogical work in order to strengthen the preparation of students; in this sense, technological tools such as YouTube video tutorials oriented to pedagogical practice require a reflective and coherent analysis that make it possible to enhance the mathematical competences of secondary education students. The research is a theoretical review of scientific literature, using the method of analysis and synthesis, exhaustive search of materials such as thesis reports, scientific articles, specialized literature, databases and information platforms related to the subject of study. The design was non-experimental, the documentary analysis technique was applied, resorting to information bases. The general objective was to analyze the strategy of YouTube video tutorials in the development of mathematical competences in high school students.

Keywords: YouTube, Video tutorials, Mathematical competence, Didactic strategy, Motivation, Technological tool.

1 INTRODUCTION

The latent concern of educational institutions is the development of mathematical competencies, capacities, skills and attitudes of students in order to mobilize their possibilities for the resolution of mathematical problems in the context of everyday life. In this sense, Íñiguez (2015) argued that competency-based teaching aims to overcome those difficulties based on a traditional

model by one that promotes its application to situations in the real context. Meanwhile, Pérez and Cuecuecha (2019) pointed out that the use of YouTube videos as a didactic resource enhances the learning process of students. Likewise, Rodríguez and Fernández (2017) showed that the application of educational videos on YouTube supports the development of competencies in Latin American students.

Below we show the precedents at the international level such as that of Cartagena (2019) Chile, indicated that, from a pedagogical approach, video as a didactic aspect makes it possible to make innovations in a dynamic way in the teaching-learning process, being a medium that combines elements of a digital nature, images, information and audio in order to achieve the learning of students; Likewise, one function is to motivate, contextualize and inform in the process of developing the learning activity. It was concluded that the use of technological resources of an educational nature contributes positively to improving the learning of the educational community.

Arboleda (2017) Colombia, pointed out that video tutorials create a pleasant and adequate environment for the development of student learning, being the optimal classroom climate that facilitates meaningful learning; It also takes advantage of images, audio and information that is transmitted in various learning styles; However, it is necessary for teachers to accept, commit, train, practice and work on the part of teachers. The results showed that the experimental group achieved 8 out of 10, while the control group achieved an average of 5.2 out of 10. It was concluded that the application of video tutorials represents a tool that enhances student learning, providing a greater understanding of information and raising the level of achievement in learning.

Meza (2015) Ecuador, indicated that video tutorials represent a guide for student learning since they continuously provide extensive information on multiple topics that are required in the training process of students and that optimize the construction of knowledge in turn provides cognitive and procedural feedback. In addition, these self-learning-based instructional systems are compelling, motivating, and innovative. The results show that 76% of respondents say that video tutorials help in a functional way in the learning process of higher level students.

Similarly, precedents at the national level, such as that of Coronado et al. (2022), argued that video tutorials are a multimedia technological tool that promotes the development of cognitive processes effectively compared to traditional teaching; As for video tutorials, they have one quality, which is accessibility at any time and promotes meaningful learning. In this sense, the YouTube platform offers a range of audiovisual resources that facilitate learning in an agile and efficient way. The results obtained were that the association between the variable video tutorials and the competence solves data management problems and uncertainty was rho=0.933 and p=0.016<0.05. It was concluded that the use of YouTube video tutorials positively favors the learning of mathematics, improving the performance of secondary school students.

Gómez (2022) indicated that the use of video tutorials is a teaching strategy and that their use is pertinent to the process of enriching students' knowledge; They also make it possible to access a level of explanation in a degree of detail and that is considered one of the educational resources in accordance with the demands of contemporary education. The results showed that there was an association between video tutorials and AutoCAD learning (rho=0.752 and p=0.000<0.05); AutoCAD Fundamentals Learning dimension (rho=0.852 and p=0.000<0.05); AutoCAD drawing learning dimension (rho=0.727 and p=0.000<0.05); AutoCAD modeling learning dimension (rho=0.720 and p=0.000<0.05). It was concluded that the application of video tutorials significantly elevates the learning process of civil engineering students.

Arrieta (2020) argued that YouTube video tutorials have made it possible to substantially improve student learning through educational content such as YouTube channels in which learning lessons are taught in an enjoyable and friendly way. Likewise, the use of these digital resources as a strategy for the provision of pedagogical material with emphasis on the improvement of learning in a new and innovative way. The results showed that X2c = 19.09 >X2 t = 5.191 and p = 0.000<0.05, in this sense it was concluded that YouTube video tutorials significantly influence the learning process of communication students.

Lindo (2020) indicated that video tutorials allow the acquisition of cognitive, procedural, and attitudinal skills, enabling learning in an optimal and fluid way; it makes it possible to solve problems through specific situations; In this sense, the integration of virtual teaching resources promotes the development of competencies in students in an innovative and creative way. The results obtained were that the control group achieved a score of 12.82 and the experimental group of 17.38 and p=0.006<0.05. It was concluded that through YouTube video tutorials, the learning achievement of students in the area of statistics was achieved.

Castillo (2019) pointed out that YouTube video tutorials can be applied in the teaching of a variety of topics and that they have a high level of effectiveness through pedagogical activities aimed at the development of cognitive and procedural skills, enabling the acquisition and assimilation of knowledge. The results were for the academic performance variable, for the experimental group a grade of M=17.78 and SD=1.396 were obtained; in the control group the score was M=14.89 and SD=1.451 and p=0.000<0.05. It was concluded that the use of YouTube video tutorials effectively contributes to the learning process of high school students.

Palacios (2019) pointed out that YouTube video tutorials are a pedagogical strategy that decisively supports the improvement in the understanding of various topics; students perceive that motivation and interest in their learning process increases significantly; Also, you can use video tutorials as many times as necessary. In this sense, video tutorials are a didactic support for teachers in the development of learning sessions and easy to understand for students. The results obtained were

that in the pre-test he obtained a score of 11.20 and in the post-test 16.80 with a difference of 5.60, with a difference in standard deviation of 0.61 and a difference in the coefficient of variation of 12.76; Likewise, Student's t-hypothesis test for the Learning variable was to= 1.732 > te = 1.729 and p=0.000<0.05. It was concluded that there is evidence to affirm that video tutorials significantly influence the learning of secondary school students.

Wong (2019) indicated that video tutorials are an educational resource that facilitates learners' learning in the acquisition of information; Likewise, it consists of presenting in an organized way through an educational video whose content has been previously selected and whose purpose is to provide a set of details in a dynamic and didactic way with respect to the object of study. Likewise, the YouTube platform provides educational support in the development of cognitive skills in students; Feedback is a decisive factor in the achievement of student learning. The results were that video tutorials and three-dimensional projects were associated with rho=0.858 and p=0.000<0.05; with the dimension interface recognition (rho=0.825 and p=0.000<0.5); with the dimension import and creation of surfaces (rho=0.775 and p=0.000<0.05) with the dimension learning in creation (rho=0.725 and p=0.000<0.05) and the dimension design (rho=0.805 and p=0.000<0.5). It was concluded that video tutorials have a favorable impact on the learning process of engineering students at a university.

2 YOUTUBE IN EDUCATION

The YouTube platform has now become one of the most widely used teaching resources, basically to complement the learning lessons developed in school classrooms; thus, YouTube's planned intervention enables teachers to create virtual spaces to build a learning community based on the content selected by the teacher (Salas, 2020). Likewise, the YouTube platform is easily accessible and allows the creation of audiovisual content, open data and a space for knowledge (Medina, 2020). In this sense, video tutorials are one of the systems whose essential purpose is autonomous learning, using electronic elements in the format of pre-recorded learning sessions with a sequence of sound and images in a dynamic way (Cárdenas, 2013). In this sense, given the complexity involved in the development of pedagogical processes, it is recommended that technological tools that support learning, such as video tutorials, be the most used by students to resolve their doubts or questions and learn autonomously (Velarde et al., 2017). Consequently, the technological capacity of platforms such as YouTube enables the transmission of information and knowledge and incorporates valuable educational resources into the various scientific areas or disciplines, being an essential support for the pedagogical work of teachers and students (Sánchez, 2018).

3 VIDEO TUTORIALS IN TEACHING MATHEMATICS

At the present time, due to the need in their training process, learners have increased the use of video tutorials in the area of mathematics that are available on the YouTube platform, where they can be used to complement the learning activities of students (Vicuña & Liern, 2020). In view of this, video tutorials are positioned in a space of relevance in pedagogical work; since it can currently be inserted into pedagogical design and implemented to optimize teachers' curricular activities (Viñas, 2018). Likewise, video tutorials motivate and generate the need for analytical, critical and autonomous research (Cárdenas et al. 2018). In addition, it is of general interest to use the online resources available on YouTube for mathematics videos whose assessment for situations related to teaching becomes necessary; Its characteristics are: (i) Epistemic suitability, referring to the quality of the mathematical content; (ii) Cognitive suitability, which is associated with the ability to transmit mathematical content; (iii) Interactional suitability, is the ability of the speaker to show an engaging and motivating video for the student; (iv) Mediational suitability, referring to the loss of time and situations not taken advantage of by the speaker; (v) Emotional suitability, is the ability of the speaker to make his or her speech or personality friendly, creates an atmosphere of tranquility; and (vi) Ecological suitability, refers to when the mathematical treatment is not adjusted to the school level of the video title (Acuña et al., 2018).

3.1 YOUTUBE EDUCATIONAL VIDEOS ON LEARNING MATH

Currently, the learning of mathematics through educational videos on YouTube is of interest to students of educational institutions because of the contribution of a wide diversity of educational content that helps students to better understand mathematical concepts and therefore to the development of mathematical skills (Rivadeneyra, 2013). The content of a video tutorial must be in accordance with the curricular subject to be learned and considering a certain level of complexity depending on the students participating in the activity; similarly, considering the student's motivation and the mathematical symbolism pertinent to the students learning the conceptual material (Cárdenas, 2015). In the field of mathematics, it is extremely necessary to use ICT resources that optimally provide a set of strategies that enable the acquisition and transformation of knowledge by the student; Likewise, mathematics plays an essential role in the learning process of a formative, instrumental and evaluative nature, whose contribution is vital in the process of building mental structures and the development of cognitive skills whose usefulness and scope are fundamental for the development of students.

3.2 MATHEMATICAL PROFICIENCY

In relation to mathematical competence, Niss (2003) defined it as "the ability to understand, judge, make and use mathematics in a variety of intra- and extra-mathematical contexts" (p.218). He proposed eight mathematical competencies:

Competencies involved in asking and answering about mathematics and through mathematics.

Competencies involved in asking and answering about mathematics and through mathematics.	▪ Think mathematically. ▪ Pose and solve mathematical problems. ▪ Know how to build models mathematically. ▪ Reason mathematically.
Comprehension of mathematical entities.	▪ Representation of mathematical entities. ▪ Handling of mathematical symbols and formalisms. ▪ Communication in, with, and about mathematics. ▪ Use of resources and tools.

Note: Niss (2003).

Regarding the general objective: To analyze the strategy of YouTube video tutorials in the development of mathematical competencies in high school students.

4 METHODOLOGY

The research is a theoretical review of scientific literature in which the method of analysis and synthesis of information was used, an exhaustive search of materials such as thesis reports, scientific articles, specialized literature, databases and information platforms related to the subject of study was carried out. Pino (2018) pointed out that scientific research is the search for information for a better understanding of reality. Carrasco (2017) indicated that scientific research is a systematic, rational, dynamic, continuous and intentional process in search of explanation of facts and phenomena of a natural or social nature. The design was non-experimental, the technique of documentary analysis was applied using information bases.

5 RESULTS AND DISCUSSION

In this section, the results of the research carried out by: Cartagena (2019) argued that educational videos are a medium that combines elements of a digital nature, images, information and audio in order to achieve the learning of students; Likewise, one function is to motivate, contextualize and inform in the process of developing the learning activity. It was concluded that the use of technological resources of an educational nature contributes positively to improving the learning of the educational community.

Arboleda (2017) pointed out that the results showed that the experimental group achieved 8 out of 10, while the control group achieved an average of 5.2 out of 10. It was concluded that the application of video tutorials represents a tool that enhances student learning, providing a greater understanding of information and raising the level of achievement in learning.

Meza (2015) pointed out that video tutorials are instructional systems based on self-learning, they are convincing and motivating and innovative. The results show that 76% of respondents say that video tutorials help in a functional way in the learning process of higher level students.

Coronado et al. (2022) pointed out that the results of the association between the variable video tutorials and competence solves data management problems and uncertainty were rho=0.933 and p=0.016<0.05. It was concluded that the use of YouTube video tutorials positively favors the learning of mathematics, improving the performance of secondary school students.

Gómez (2022) pointed out that, according to the results, there is an association between video tutorials and AutoCAD learning (rho=0.752 and p=0.000<0.05); AutoCAD Fundamentals Learning dimension (rho=0.852 and p=0.000<0.05); AutoCAD drawing learning dimension (rho=0.727 and p=0.000<0.05); AutoCAD modeling learning dimension (rho=0.720 and p=0.000<0.05). It was concluded that the application of video tutorials significantly elevates the learning process of civil engineering students.

Arrieta (2020) indicated that the use of these digital resources as a strategy for the provision of pedagogical material with an emphasis on improving learning in a novel and innovative way. The results showed that X2c = 19.09 >X2 t = 5.191 and p = 0.000<0.05, in this sense it was concluded that YouTube video tutorials significantly influence the learning process of communication students.

Lindo (2020) indicated that video tutorials make it possible to solve problems through specific situations; In this sense, the integration of virtual teaching resources promotes the development of competencies in students in an innovative and creative way. The results obtained were that the control group achieved a score of 12.82 and the experimental group of 17.38 and p=0.006<0.05.

Castillo (2019) specified that, according to the results for the academic performance variable, the experimental group obtained a grade of M=17.78 and SD=1.396 and the control group obtained a grade of M=14.89 and SD=1.451 and p=0.000<0.05. It was concluded that the use of YouTube video tutorials effectively contributes to the learning process of high school students.

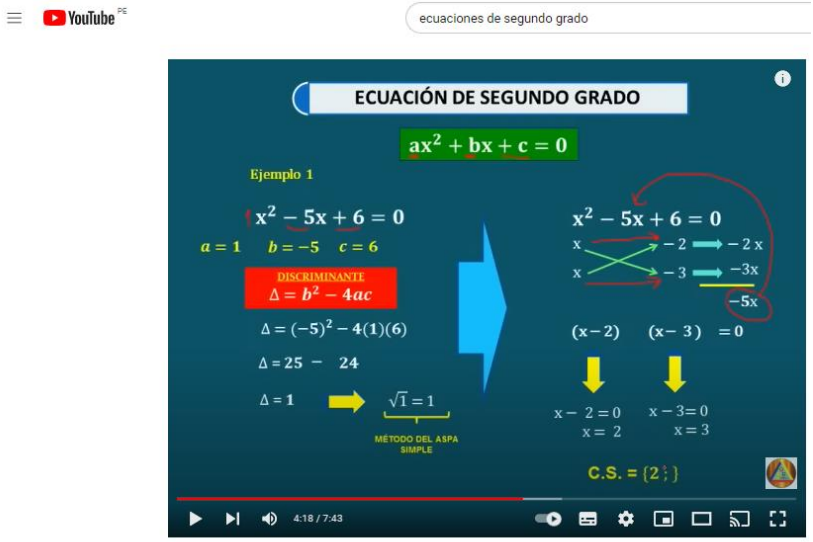
Palacios (2019) pointed out that video tutorials are a didactic support for teachers in the development of learning sessions and easy to understand for students. The results obtained were that in the pre-test he obtained a score of 11.20 and in the post-test 16.80 with a difference of 5.60, with a difference in standard deviation of 0.61 and a difference in the coefficient of variation of 12.76; Likewise, Student's t-hypothesis test for the Learning variable was to= 1.732 > te = 1.729 and p=0.000<0.05. It was concluded that there is evidence to affirm that video tutorials significantly influence the learning of secondary school students.

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learning in creation (rho=0.725 and p=0.000<0.05) and the dimension design (rho=0.805 and p=0.000<0.5).

5.1 ILLUSTRATIONS, TABLES, FIGURES

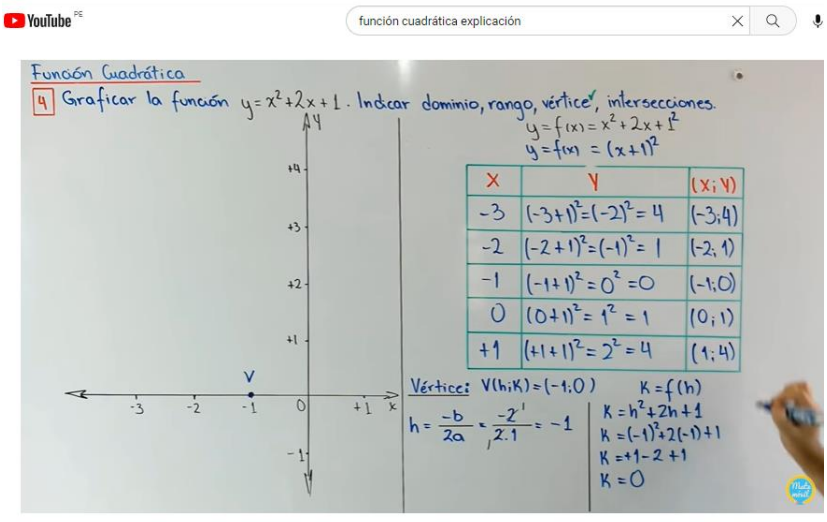
Figure 1. How to Solve a Second Degree Equation by Single Blade



COMO RESOLVER UNA ECUACIÓN DE SEGUNDO GRADO POR ASPA SIMPLE

https://www.youtube.com/watch?v=Zco9zv9dwpE

Figure 2. Quadratic Function Explained



Función Cuadrática - Ejercicios Resueltos - Nivel 1

https://www.youtube.com/watch?v=Ql8L09-HsI0&t=830s

6 CONCLUSIONS

YouTube video tutorials are an audiovisual strategy that contains a variety of educational videos and helps to improve the level of development of mathematical skills in student learning; Likewise, the content component is designed in such a way that it motivates and generates interest in deepening the knowledge of mathematics from the cognitive, procedural and attitudinal point of view; Through

the use of this resource, it provides a pedagogical complement in the process of learning mathematics of secondary school students in educational institutions.

REFERENCES

Acuña-Soto, C.M., Larios-Osorio, V., Liern-Carrión, V., Blasco-Blasco, O.M.,y Lafuente-Lechuga, M. (2018). Valoración de videotutoriales de matemáticas disponibles en internet con el modelo ValFM (Valoración Flexible Multicriterio). Laboratorio Iberoamericano para la valoración de procesos educativos de la enseñanza de la matemática (LABIPE). 1-6. https://www.uv.es/liern/LABIPE.pdf

Acuña-Soto, C.M. (2020). Modos de enseñanza en los videotutoriales de matemáticas: equilibrio entre eficacia puntual y utilidad formativa. Bolema, Rio Claro (SP), 34(68), 1125-1143. https://www.scielo.br/j/bolema/a/MS7Z7CLSsXjd3WM6Gcf95qQ/?format=pdf&lang=es

Arboleda-Montoya, J.G. (2017). Videotutoriales como recursos de enseñanza en los procesos de aprendizaje de enrutadores. (Tesis de maestría). Tecnológico de Monterrey. Medellin, Colombia. https://repository.unab.edu.co/bitstream/handle/20.500.12749/3206/2017_Tesis_Javier_Gonzalo_Arboleda_Montoya.pdf?sequence=1&isAllowed=y

Arrieta-Pastrana, D.H. (2020). Plataforma de Videos YouTube y Aprendizaje de los Estudiantes del Programa Académico de Ciencias de la Comunicación de la Universidad Científica del Perú. (Tesis de licenciatura). Universidad Científica del Perú. Loreto, Perú. http://repositorio.ucp.edu.pe/bitstream/handle/UCP/1590/ARRIETA%20PASTRANA%20DANIEL%20HUGO%20-%20TESIS.pdf?sequence=1&isAllowed=y

Cárdenas-Enríquez, D.Y., Murgado-Hamann, V.P., Quispe-Rodríguez, J.A., y Vargas-Tour, J.A. (2018). Uso de videotutoriales en la construcción de aprendizaje significativo, en las clases de los estudiantes del 6° ciclo del curso de "edición de audio", de la carrera de ciencias de la comunicación de una universidad privada de Lima. (Tesis de maestría). Universidad Tecnológica del Perú. https://repositorio.utp.edu.pe/bitstream/handle/20.500.12867/1769/Daniel%20Cardenas_Victoria%20Murgado_Jes%C3%B9s%20Quispe_Jos%C3%A8%20Vargas_Trabajo%20de%20Investigaci%C3%B2n_Maestria_2018.pdf?sequence=1&isAllowed=y

Cárdenas-Gonzáles, E.S. (2015). Video tutoriales. Una estrategia B-S. Learning A propósito de los estilos de enseñanza-aprendizaje de las matemáticas y la física. Boletín virtual, 4(8), 99-102. https://dialnet.unirioja.es/descarga/articulo/6245328.pdf

Cárdenas-Martínez, J.A. (2013). Video tutorial virtual como herramienta didáctica en el desarrollo de capacidades en geometria analítica en los estudiantes de Ingeniería. (Tesis doctoral). Universidad de San Martín de Porres. Lima, Perú. https://repositorio.usmp.edu.pe/bitstream/handle/20.500.12727/1144/cardenas_mja.pdf?sequence=1&isAllowed=y

Cartagena-Ortiz, P. (2019). Propuesta educomunicacional para profesores de lengua y literatura: curso creación y uso del video en el aula. (Tesis de maestría). Pontificia Universidad Católica de Chile. Santiago, Chile. https://repositorio.uc.cl/xmlui/bitstream/handle/11534/23667/TESIS%20FINAL%20Paz%20Cartagena%20Ortiz.pdf

Castillo-Sologuren, F.A. (2019). Metodología utilizando Video-tutoriales y su efecto en el rendimiento académico de los estudiantes de Diseño de una universidad de Lima. (Tesis de maestría). Universidad Ricardo Palma. Lima, Perú. https://repositorio.urp.edu.pe/bitstream/handle/20.500.14138/2915/DOC_T030_10266805_M%20%20%20CASTILLO%20SOLUGUREN%20FERNANDO%20ANDRES.pdf?sequence=1

Coronado-Peña, E.M., Odiaga-Campos, F., Salas-Nolasco, J.M. y Vasquez-Perea, R.R. (2022). Videos tutoriales y la competencia resuelve problemas de gestión de datos e incertidumbre. (Tesis de licenciatura). Escuela de Educación Superior Pedagógica Pública Monterrico. https://repositorio.monterrico.edu.pe/bitstream/20.500.12905/2082/1/Tesis_MF_Coronado%20P.pdf

Feliciano-Morales, A. y Cuevas-Valencia, R.E. (2021). Use of ICT in the Learning of Mathematics at the Higher Level. Revista Iberoamericana para la Investigación y el Desarrollo Educativo, 12(23), 1-15. https://www.scielo.org.mx/pdf/ride/v12n23/2007-7467-ride-12-23-e020.pdf

Gómez-Meza, J.J. (2022). Influencia de los videos tutoriales en el aprendizaje de software AutoCAD, en estudiantes de educación superior de Lima, 2021. (Tesis doctoral). Universidad César Vallejo. https://repositorio.ucv.edu.pe/bitstream/handle/20.500.12692/76817/Gomez_MJJSD.pdf?sequence=1&isAllowed=y

Íñiguez-Porras, F.J. (2015). The development of mathematical competence in experimental science Classroom. REVISTA IBEROAMERICANA DE EDUCACIÓN, 67(2), 117-130. https://rieoei.org/historico/deloslectores/6761Iniguez.pdf

Lindo-Pizarro, C.F. (2020). El video tutorial you tube en el aprendizaje de la estadística descriptiva en estudiantes de la facultad de contabilidad de la Universidad Nacional Agraria de la Selva, Tingo María 2018. (Tesis doctoral). https://repositorio.unheval.edu.pe/bitstream/handle/20.500.13080/6420/TDr.E00067L65.pdf?sequence=1&isAllowed=y

Medina-Montoya, L.M. (2020). YouTube, como herramienta de aprendizaje En la Institución Educativa Joaquín Cárdenas Gómez San Carlos (Antioquia, Colombia). Corporación Universitaria Minuto de Dios. República de Colombia. https://repository.uniminuto.edu/bitstream/10656/14963/1/T.C_MedinaMontoyaLuisaMaria_2020.pdf

Meza-Manzano, J.A. (2015). Utilización de video tutoriales como mediador del proceso enseñanza aprendizaje para la capacitación en el diseño de cursos virtuales en el Instituto Superior Pedagógico “Dr. Misael Acosta Solís”. (Tesis de maestría). Pontificia Universidad Católica del Ecuador. Ambato, Ecuador. https://repositorio.pucesa.edu.ec/bitstream/123456789/1494/1/75997.pdf

Niss, M. (2003). Quantitative Literacy and Mathematics Competencies. En Quantitative Literacy: Why Numeracy Matters for Schools and Colleges, MATHEMATICAL ASSOCIATION OF AMERICA, 215-220. http:// www.maa.org/ql/pgs215_220.pdf

Palacios-Manrique, M.C. (2019). Influencia de videos tutoriales en el aprendizaje de los estudiantes del quinto grado “A” de educación secundaria, del área de educación para el trabajo de la Institución Educativa Las Palmas, Nuevo Chimbote, 2018. (Tesis de maestría). Universidad César Vallejo. Chimbote, Perú. https://repositorio.ucv.edu.pe/bitstream/handle/20.500.12692/40149/Palacios_MMC.pdf?sequence=1&isAllowed=y

Pérez-Gómez, J.A. & Cuecuecha-Mendoza, A. (2019). El efecto de usar YouTube como apoyo didáctico en calificaciones de microeconomia. Apertura, 11(2), 22-39. https://www.scielo.org.mx/pdf/apertura/v11n2/2007-1094-apertura-11-02-22.pdf

Rivadeneira-Loor, F.Y. (2013). Los canales de matemáticas de YouTube y su aporte en el proceso de enseñanza aprendizaje. Acta del CIBEM, 6923-6930. http://funes.uniandes.edu.co/19646/1/Rivadeneira2013Los.pdf

Rodríguez-Villalobos, M.C. & Fernández-Garza, J. (2017). Uso del recurso de contenido en el aprendizaje en línea: YouTube. Apertura, 9(1), 22-31. http://dx.doi.org/10.32870/Ap.v9n1.1018

Salas-Guerrero, C.A. (2020). Análisis del impacto del uso de la plataforma YouTube para el aprendizaje de solución de ecuaciones de primer grado en los estudiantes de noveno grado de la Institución Educativa Fulgencio Lequerica Vélez de la Ciudad de Cartagena de Indias. Universidad Nacional Abierta y a Distancia. República de Colombia. https://repository.unad.edu.co/bitstream/handle/10596/35881/csalasg.pdf?sequence=1

Sánchez-Navarro, M.J. (2018). Uso didáctico de las tecnologías de la información y la comunicación y su contribución a la formación de competencias en estudiantes de educación media. (Tesis de maestría). Universidad de Panamá. http://up-rid.up.ac.pa/1441/1/magda_sanchez.pdf

Velarde-Alvarado, A., Dehesa-Martínez, J.M., López-Pineda, E., y Márquez-Juárez, J. (2017). Video tutorials as a support to the teaching-learning process and its pedagogical implications in instructional design. Revista EDUCATECONCIENCIA, 14(15), 67-86. https://core.ac.uk/download/pdf/268579032.pdf

Viñas, M. (2018). Creando videos educativos. Principios básicos del aprendizaje multimedia y herramientas esenciales. Totem Guard Academy.

Wong-Silva, J.P. (2019). Videos tutoriales y el aprendizaje en la elaboración de proyectos en tres dimensiones en los estudiantes del centro informática sistemas de ingeniería civil, de la Universidad César Vallejo – Los Olivos. (Tesis doctoral). Universidad de San Martín de Porres. Lima, Perú. https://repositorio.usmp.edu.pe/bitstream/handle/20.500.12727/6083/wong_sjp.pdf?sequence=1&isAllowed=y

SEVEN publicações acadêmicas

The adoption of dog-assisted activity in the university environment as a tool to minimize the stress of academics

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ABSTRACT
This study examined the impact of Animal-Assisted Intervention (AAI), specifically contact with a therapist dog, on reducing stress among university students. The research was conducted at the Pontifical Catholic University of Paraná (PUCPR) in 2021 and involved nine medical students enrolled at the university. Inclusion criteria included no fear of or allergy to dogs. The results revealed that interaction with the dog had positive effects on reducing the students' stress. Although there were no significant changes in heart rate, systolic blood pressure decreased significantly after the interaction. In addition, the students' levels of stress, anxiety, tension and worry decreased after the session with the dog, and no student reported elevated levels of these parameters after the interaction. The students also mentioned that, during the interaction with the dog, they were able to momentarily forget their worries, which suggests a temporary relief from stress. In addition, the majority of participants stated that they would recommend the Animal Assisted Intervention. These results indicate that AAI, even in short sessions, can be effective in reducing stress among university students. The presence of a therapist dog creates a pleasant social atmosphere and offers emotional support, improving students' mental health. Therefore, the implementation of animal-assisted therapy programs in academic settings can be beneficial in helping undergraduate students cope with stress and anxiety, promoting a healthier learning environment.

Keywords: Animal-assisted activity, Well-being, Students, University.

1 INTRODUCTION

A first definition suggests that stress results from pressure (external stimulus) which, when it becomes too great, leads to an inevitable (internal) collapse (Luber, 2004). The second, on the other hand, focuses on the harmful response to the stimulus in physiological terms, such as those represented by the sympathetic activities of the adrenal or pituitary-adrenal-cortical medulla (Selye, 1956). Stress arises at some point in the day and with it occurs some situations that affect physiological changes or emotional state. These alterations can be effective up to a certain moment, but when in excess, they trigger numerous situations, generating stress, and their responses vary among individuals (Reis et al., 2010).

College students experience stress throughout their academic journey, often due to distance from home, and from taking on adult responsibilities often for the first time (Mckerrow et al., 2020). Therefore, finding the balance between study, family, and work can be tricky to achieve. Young people have been affected by social anxiety, whose main characteristic is fear or anxiety about one or more social situations in which the individual is exposed to possible evaluation by other people (Sapienza, 2018). Stress negatively impacts the learning and academic performance of university students, and can lead to depression and lead to dismissal from the course and exit from the university (Pascoe et al., 2020). This population is also prone to sleep disorders, substance use, and suicide (Liu et al., 2019).

Thus, as a strategy to alleviate stress, methodologies with the use of animals were analyzed, for example, the program regulated by the Delta Society (1996) in the United States. Therefore, in this method, Animal Assisted Interventions are divided into two groups: Animal Assisted Activity (AAA) and Animal Assisted Therapy (AAT). AAA involves therapy practices with an animal, entertainment activities, motivation, and improved quality of life. On the other hand, AAT incorporates a formal therapeutic process, with well-defined objectives, which must be performed by health professionals (Delta Society, 1996).

In addition to AAA and AAA, some universities have used Animal-Assisted Intervention (AAI) as a way to reduce stress, and it has shown positive results in reducing stress symptoms, improving mood, and even academic performance (Pendry and Vandagriff, 2019).

With this, the therapy animal must also have a calm temperament and inspire confidence, like to be played, hugged and touched. In addition, the animal must undergo specific training for this activity (Fülber, 2011; Mores et al., 2021).

Attending university has long been identified as a potentially stressful experience (Reis et al., 2010). Factors contributing to student stress include the transition from home to independent living, increased academic expectations, time management, new roles, social demands, and sleep deprivation (Macan et al., 1990; Scott and O'Hara, 1993). Although young people have their first experience free from parental monitoring, this provides an opportunity for independence, leading to greater responsibility and constraints, and causing anxiety and stress to students (Aron et al., 2010).

Universities are increasingly looking for ways to support the social and emotional development of academics by offering mental health support services, such as one-on-one counseling with a healthcare professional (Binfet et al., 2017). As a way to reduce stress, programs with therapy dogs are being installed at colleges. In the United States, dog therapy is significant. About 1,000 university campuses in the country offer the student population the opportunity to practice the activity with animals for five to 45 minutes a day (Crossman and Kardin, 2017). Canine therapy is considered a therapeutic approach, allowing students the opportunity to interact with dogs, reducing stress (Crossman and Kazdin, 2015; Barker et al., 2016).

It is known that living with pets brings benefits, both for physical and psychological health (Coutinho et al., 2014). In England, in 1972, there were the first records of the therapeutic relationship between animals and humans, at the Retreat Psychiatric Hospital in York, where animals were used to stimulate patients with mental disorders in tasks such as reading, writing and dressing. Nise da Silveira, a psychiatrist, in the 1950s, treated patients with schizophrenia at the Dom Pedro II Psychiatric Hospital in Rio de Janeiro, using co-therapist animals in her care (Bustad, 1986; Stumm et al., 2012; Jarolmen and Patel, 2018).

The benefits of this interaction between man and animal are known in terms of mental health, and have positive results, for example, in the case of depression and anxiety disorder (Berzins, 2000). Studies have shown that contact with animals decreased stress, lowered blood pressure, heart rate, and cholesterol (Anderson et al., 1992), and improved depression and personal isolation (Souter and Miller, 2007). The presence of animals improves the quality of life of people undergoing medical and psychological treatments (Vieira et al., 2016). Thus, Animal-Assisted Intervention (AAI) promotes physical, psychological, and educational benefits through the reduction of anxiety (Binfet et al., 2017).

In Brazil, PUCPR was a pioneer in implementing a project with therapy dogs, through the institution's Psychopedagogical Support Service (SEAP), which is called "Projeto Focinhos". Dogs are not only used in university spaces (such as classrooms and courtyards), but in clinical settings, such as hospitals and geriatric care centers, aiming to reduce stress and improve the social and emotional well-being of those in need (Binfet et al., 2018).

2 MATERIALS AND METHODS

The present research was carried out in the first week of February 2021 and, due to the pandemic, an isolated environment was used on the ground floor of the green block (block 3), at the Pontifical Catholic University of Paraná (PUCPR) on the Curitiba Campus, in different stages, after approval by the CEP (Human Research Ethics Committee – 3,048,013).

As inclusion criteria, only students who were duly enrolled in the university (PUCPR) and who did not have fear or allergy to dogs were used. In this way, those students who showed interest in participating in the interaction with the dog were invited and guided about participation.

To start the sessions, the students were sent to a specific place reserved on the ground floor of the green block – block 3 at PUCPR, respecting the safety protocols indicated by the World Health Organization (WHO) for the prevention of COVID-19, where the evaluations of physiological parameters were carried out, according to the evaluation protocol of the Brazilian Guidelines on Arterial Hypertension (Brazilian Society of Cardiology). The following were performed: 1) Temperature measurement using an Omron digital thermometer, 2) Heart rate measurement was performed using a 3MLittman® stethoscope, in which the heart rate ranges from 60 – 100 beats per

minute (bpm) and 3) Blood pressure (BP) was measured with an adult PaMed sphygmomanometer, where the onset of auscultatory noises, systolic BP was considered to be equivalent to 120 mmHg, and the extinction of auscultatory sounds was considered to be diastolic BP equivalent to 80 mmHg.

After this stage, the students were sent to the place where the male Golden Retriever dog was neutered. In this place, there was a table with various dog toys (ball, rope, brush, rubber toys, among others) and the dog's tutor. Prior to the session, the students were instructed on the freedom to interact with the dog for a total period of seven minutes, which could be sufficient to reduce anxiety, distress and the promotion of positive thoughts, as defined by Hoffmann et al. (2009).

Physiological evaluations were performed by a health student at the beginning of the session (minute 0) and at the end of the session (minute 7).

Before and after the sessions, there was also the application of a questionnaire focused on emotional aspects, such as levels of anxiety, stress, tiredness, worries and what is the interest of students in dog-assisted interactions in the university environment.

2.1 STATISTICAL ANALYSIS

The D'Agostino and Pearson test was used to analyze the normality of the data. The influence of the intervention on physiological parameters was analyzed using the paired Student's *t-test*. Correlation between the investigated parameters was analyzed using Pearson's correlation test. The analyses were performed using the statistical software IBM SPSS Statistics version 25 (IBM Corp, Armonk, NY, USA) considering significant values of $p < 0.05$.

3 RESULTS

Of the nine students analyzed, eight were female and one was male. Some expected results were obtained, such as the reduction of stress and the interaction of the dog with the students. This interaction was considered beneficial, because at some point in the interaction they were able to forget what they were really worried about.

Table 1 shows the means of the physiological parameters evaluated before and after the interaction. There was no difference for heart rate (HR) ($p = 0.2231$). In some cases, there was an increase in HR due to the activity performed with the dog. Systolic blood pressure (BP) was significantly lower later than before (108.9 ± 6.0 vs. 127.8 ± 9.7 mmHg, $p = 0.0003$), and only one student did not show a decrease, but maintained both systolic and diastolic blood pressure. There was a strong positive correlation between HR and maximum BP at the time before ($p = 0.007$; $r = 0.817$).

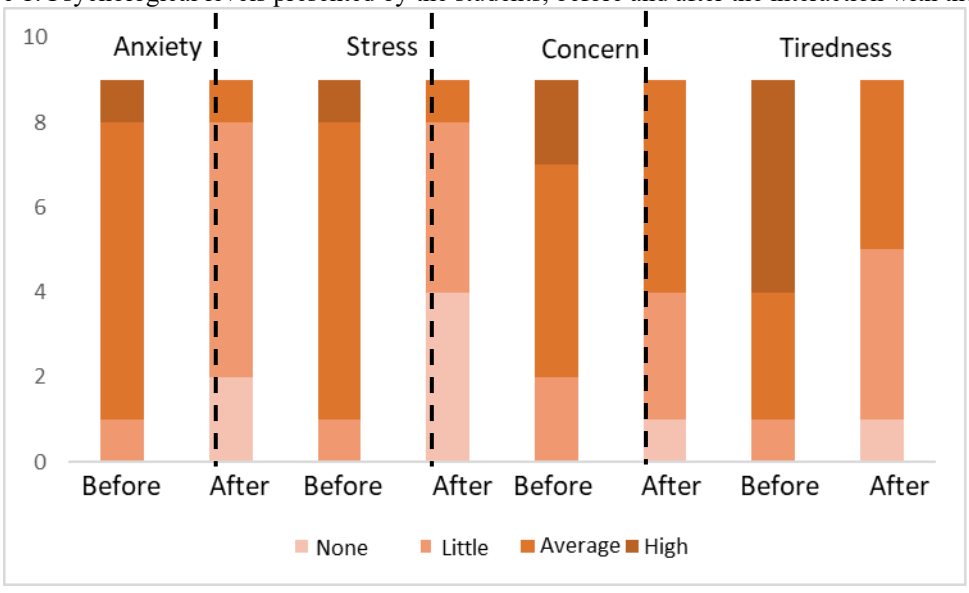
Table 1 – Physiological parameters of temperature, heart rate before and after, blood pressure before and after the interaction between medical students at PUCPR and a Golden Retriever dog during an animal-assisted therapy session.

Students	Temperature °C (before)	Heart Rate bpm (before)	Heart Rate bpm (after)	Blood Pressure mmHg (before)	Blood Pressure mmHg (after)
Student 01	36,2	76	101	130x80 cm	110x70
Student 02	35,8	62	83	110x70	110x70
Student 03	36,0	84	86	120x90	100x70
Student 04	36,4	91	94	140x80	120x80
Student 05	36,0	76	96	120x80	110x80
Student 06	35,9	79	75	130x80	110x80
Student 07	36,7	89	105	140x90	110x60
Student 08	36,2	90	74	130x80	100x60
Student 09	36,0	83	74	130x90	110x80
Average	36,1	81,1	87,5	127x82	108x72

Beats per minute (bpm), Celsius (C), Millimeters of mercury (mmHg).

Figure 1 shows the comparisons between the psychological levels before and after the interaction with the dog. It was observed that before the interaction with the dog, the students had medium and high levels of stress, worry, fatigue and anxiety; Of the nine students, only one had a low level of these psychological parameters and two were not very worried. After the interaction with the dog, there were some changes in the psychological levels of the students. Fatigue levels, which were relatively high, were reduced to medium, little or none; the levels of concern, which were average, became few; Stress levels that were high went to little or none, and finally, anxiety levels went to little or none. What was possible is that, after the interaction, none of the students checked the high option.

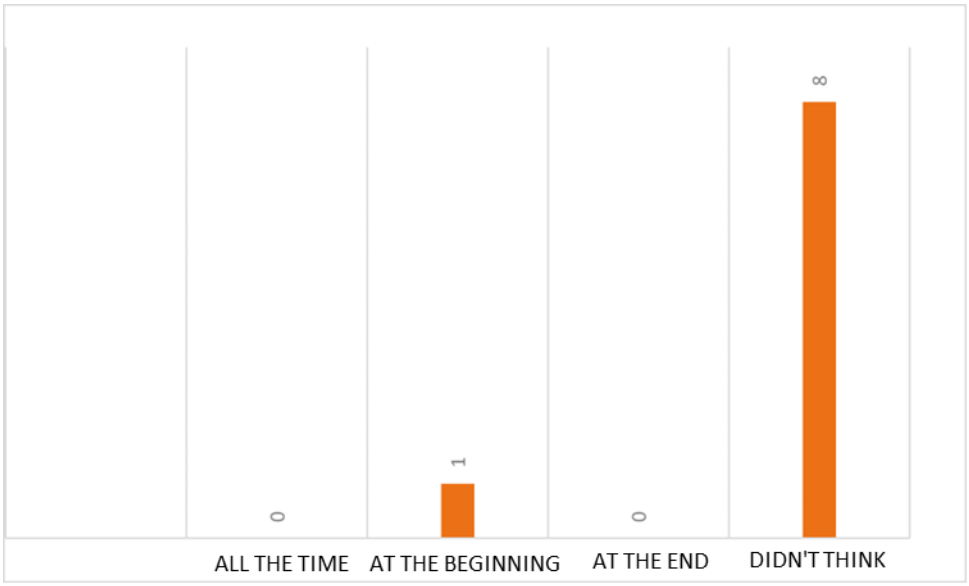
Figure 1: Psychological levels presented by the students, before and after the interaction with the dog.



In the answer to the question: "what worries you the most" for some students did not change what really worried, such as college in the distance learning format, the pandemic and the DETRAN practical test; On the other hand, some forgot for a moment what they had written, and other worries arose such as lunch or did not remember if there were any worries at that time.

Regarding the question about whether the student had thought about his initial concern during the interaction with the dog, 90% did not think about the concern, only 10% thought about it and it was only at the beginning of the interaction (figure 2). And finally, the last question included in the questionnaire was whether the student would recommend IAA, and all of them answered yes.

Figure 2: Number of students in relation to the moment when, during the interaction with the animal, they thought about the concern reported before the interaction.



4 DISCUSSION

Reports in the literature show that a single group therapy session with dogs can relieve the stress that students have because of grades, homesickness, family problems, among others (Jarolmen & Patel, 2018). Considering that stress causes numerous stimuli that provoke hormonal excitement, causing homeostasis of the organism and triggers an adaptation process, both physiological and behavioral (Reis et al., 2010), the present study addressed these processes in the questionnaires applied, where behavioral changes were evaluated, such as worry, tiredness, tension, anxiety and stress, in phases that show the person's stress level (alert, resistance, near-exhaustion, and exhaustion).

The students evaluated showed a lower degree of concern after interacting with the dog, for some moments they were also able to forget what worried them; However, some have not been able to completely forget their worries, or even reduce their discomfort. Coutinho et al. (2014) stated that pets bring benefits to both physical and psychological health (), which was corroborated in the present

study, in which it was perceived that the interaction between the dog and the student, even if of short duration (seven minutes) was beneficial.

In this study, it was not possible to prove a decrease in cholesterol, but a decrease in systolic and diastolic blood pressure and heart rate did. Anderson et al. (1992) concluded that, in addition to bringing benefits to mental health, contact with animals can reduce or normalize blood pressure, heart rate, and cholesterol, in addition to combating depression and personal isolation ().

Some universities are implementing therapy dogs into their routine, aiming for students to have a lower rate of psychological distress and social interaction (Stallman, 2010; Eskin et al., 2016). Thus, this study at PUCPR aimed to carry out a stress assessment of the students, and their interest in the implementation of a therapy dog program in the institution.

Other studies have pointed out that just one therapy session with dogs can reduce the stress that students have, in addition to alleviating homesickness, and relieving other psychological problems (Binfet, 2017). In the present work, it is demonstrated that a single seven-minute session with the dog was able to relieve or alleviate the stress that the student presented, in addition to making him forget for a moment the homesickness and other worries that afflicted them.

The presence of a dog inside the university creates a social, pleasant atmosphere, an essential component for a good functioning, which represents a precondition for learning. Some universities in Canada and the United States, which are working to reduce student stress, have implemented animal-assisted therapy programs (Delgado et al., 2017). In Brazil, there are some Educational Institutions such as the Pontifical Catholic University of Paraná (PUCPR), which implemented the IAA with the Snouts Project, which aims to reduce students' anxiety.

It can be said that the IAA in the academic sphere has been successful. Changes in heart rate and blood pressure were observed, as well as psychological levels such as anxiety, stress, tension, worry, and tiredness.

5 CONCLUSION

The IAA in the academic realm has been successful. Changes in heart rate and blood pressure were observed, as well as psychological levels such as anxiety, stress, tension, worry, and tiredness. Although this study evaluated a small group of students who interacted with the therapy dog for seven minutes, it was shown to be an effective way to provide support to students suffering from stress or anxiety.

REFERENCES

Berzins MAVS. Velhos, cães e gatos: interpretação de uma relação. Dissertação (Mestrado em Gerontologia) - Curso de Pós-graduação em Gerontologia. 2000, Pontifícia Universidade Católica de São Paulo; 132f

Binfet JT, Struik K. Dogs on campus: Holistic assessment of therapy dogs and handlers for research and community initiatives. Society & animals. 2018 Feb 26;1(aop):1-21.

Binfet JT, Passmore HA, Cebry A, Struik K, McKay C. Reducing university students' stress through a drop-in canine-therapy program. J Ment Health, Early Online. 2017; 1–8.

Bustad L K. Animals in society. National Forum, Vienna, Austria: The Phi Kappa Phi Journal. 1986. LXVI; 1.

Coutinho M, Yuko B, Kitagawa C, Dall'Acqua S. "Benefícios advindos da interação homem-cão". Revista do Instituto de Ciência da Saúde. 2014; Vol.22: p.123-128.

Crossman M K, Kazdin AE, Knudson K. Brief Unstructured Interaction with a Dog Reduces Distress, Anthrozoös. 2015; 28:4, 649-659, DOI: 10.1080/08927936.2015.1070008

Delta Society. Standards of Practice in Animal – Assisted Activities and Animal Assisted Therapy. Delta Society. Renton, WA. EUA. 1996

Gomes JP. Estresse: Quando a faculdade vira máquina de ''moer gente''. Jornal da USP, 2017.

Jarolmen, J., & Patel, G. The effects of animal-assisted activities on college students before and after a final exam. Journal of Creativity in Mental Health, 2018; 13(3), 264-274.

Kobayashi CT, Ushiyama ST, Fakih FT, Robles RA, Carneiro IA, Carmagnani MI. Desenvolvimento e implantação de Terapia Assistida por Animais em hospital universitário. Revista Brasileira de Enfermagem. 2009 Aug;62(4):632-6.

Lipp MEN. Inventário de sintomas de stress para adultos de Lipp - ISSL. 2000; São Paulo: Casa do Psicólogo.

Lichtenfeld S, Stupniski R H. Elementary school students' achievement emotions: Influences of gender and relations to motivation and achievement. In L. Zhang and J. Chen (Eds.), Academic achievement: Predictors, learning strategies, and influences of gender. 2013; 33-6

Liu CH, Stevens, C, Wong SHM, Yasui M, Chen JA. The prevalence and predictors of mental health diagnoses and suicide among U.S. college students: Implications for addressing disparities in service use. Depression and Anxiety, v. 36, n. 1, p. 8–17, 2019.

Luber KM. The definition, prevalence, and risk factors for stress urinary incontinence. 2004; Reviews in urology, v. 6, n. Suppl 3, p. S3,.

Mckerrow I,Carney PA; Caretta-Weyer H, Furnari M, Miller Juve A. Trends in medical students' stress, physical, and emotional health throughout training. Medical Education Online, v. 25, n. 1, 2020. Taylor & Francis. Disponível em: https://doi.org/10.1080/10872981.2019.1709278

Mores, M.C.P.; Cintra, A.C.R.; Cavalcante, C.Z.; Sotomaior, C.S.; Michelotto, A.L.L. Há critérios para a inclusão de cães em Intervenções Assistidas por Animais em ambiente universitário? Revista Acadêmica Ciência Animal, v.19, 2021. Disponível em: https://doi.org/10.7213/acad.2021.19101

Pascoe MC,, Hetrick SE, Parker AG. The impact of stress on students in secondary school and higher education. International Journal of Adolescence and Youth, v. 25, n. 1, p. 104–112, 2020. Routledge. Disponível em: <https://doi.org/10.1080/02673843.2019.1596823

Pendry P, Vandagriff JL. Animal visitation program (AVP) reduces cortisol levels of university students: A randomized controlled trial. AERA Open. 2019 Jun;5(2):2332858419852592

Reis ALPP., Fernandes, SRP, GOMES AF. Estresse e fatores psicossociais. Psicologia Ciência e Profissão, 2010 v. 30, n.4, p. 712-725.

SELYE, H. The Stress of Life. New York, McGraw-Hill. 1956.

Souter MA, Miller MD. Do animal-assisted activities effectively treat depression? a meta-analysis. *Anthrozoos*. 2007; 20(2): 167–180.

Vasconcelos TC, Dias BRT, Andrade LR, Melo GF, Barbosa L, Souza E. Prevalência de Sintomas de Ansiedade e Depressão em Estudantes de
Medicina. Revista Brasileira de Educação Médica. 2014; 39: 135-142.

Wintre MG, Yaffe M. First-year Students' Adjustment to University Life as a Function of Relationships with Parents. Journal of Adolescent Research. 2000; 15: 9-37.

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Physical therapy treatment for pelvic floor strengthening in women after vaginal delivery: A systematic review

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ABSTRACT

Introduction: Pregnancy and vaginal birth are considered risk factors for pelvic floor dysfunction (PFD) development, as urinary incontinence (UI), fecal incontinence (FI), pelvic organ prolapse (POP) and sexual dysfunction. Pelvic floor muscle training (PFMT) is a physiotherapeutic resource for PFD treatment, considered UI golden standard treatment with benefits also proven in postpartum women. Though, the lack of standardization of protocols brings gaps in scientific knowledge. Objective: To answer the question "Postpartum pelvic floor muscle training affects pelvic floor muscle strength, urinary function and sexual function?". Methods: systematic review involving randomized clinical trials. Databases: PubMed, Cochrane Central Register of Controlled Trials, PEDro, LILACS, SciELO, EMBASE e MEDLINE, beyond gray literature. Two reviewers selected the studies through the Rayyan program. Were included studies conducted with primiparous women up to one year after childbirth that used the following resources: vaginal cones or balls, electric stimulation, biofeedback, and PFMT, that have compared resources to usual care, placebo, or other treatment. The risk of bias was assessed using the PEDro Scale by two reviewers. Results: 1.381 articles were found, with 508 duplicates. After titles and abstract reading 79 were included for complete reading, then only eight were included for analysis. Most articles compared PFMT and PFMT instructions. Using the PEDro Scale, three included articles scored 8, one scored 7, one scored 6, two scored 5 and only one study scored 4. The main outcomes assessed were PFM contraction strength, endurance time, UI, and sexual function. Strength was mainly assessed by manometry and Oxford Scale, UI by questionnaires and Pad Test, and sexual function by questionnaires. Five studies showed improvement in PFM strength in the intervention group, two studies showed improvement in UI in the intervention group, and two studies showed improvement in sexual function in the intervention group. Conclusion: PFMT was beneficial for primiparous women up to one year after vaginal delivery, improving PFM strength, UI, and sexual function. Nevertheless, more studies with greater quality and greater homogeneity of the protocols and populations are needed.

Keywords: Postpartum, Pelvic floor, Physiotherapy, Strength training, Systematic review.

1 INTRODUCTION

The structural integrity of the pelvic floor, composed of muscles, fascia, and ligaments, is known to be essential for the maintenance of urinary and anal continence functions, mode of delivery, and sexual activity (DESILVA *et al*, 2017). However, this integrity can be affected by several factors

such as hormonal changes, tobacco use, obesity, chronic intra-abdominal pressure factors, impact physical activity, parity and childbirth that can cause a decrease in the strength of the pelvic floor muscles (PFM). This is due to prolonged and increasing exposure to pressures, pulls, and distensions caused by increased abdominal volume containing the baby's weight, amniotic fluid, and placenta. In addition, vaginal delivery, by itself, can cause functional alteration of the pudendal nerve, responsible for both sensitivity and motor activation of PFM, in addition to increasing the chance of partial or total deinsertion of the pelvic floor muscles (ASSIS *et al*, 2013; HANDA *et al*, 2019; HAN *et al,* 2021).

Studies (KHAJEHEI *et al,* 2015; REZAEI et al, 2017) *conducted with postpartum women between six months and one year after delivery indicate a prevalence of 64 to 76% of sexual dysfunctions, 63% prevalence of stress urinary incontinence (SUI) and 39% of fecal incontinence (FI), in addition to 9% of prolapse after the first delivery (RIKARD-BELL et al, 2014*). Some of the PAD (pelvic floor dysfunctions) have a negative impact on physical, mental and social well-being, with impairment in the practice of physical exercise, daily activities, work, social participation, sexual relations and self-esteem. As a result, social isolation may gradually increase, due to fear and shame of their condition, thus increasing the risks for the development of depression, anxiety, and other diseases such as diabetes (FELDE et al 2012, HARVEY 2003, AALAIE 2021, BANKOSKI et al 201, DUMOULIN et al 2014).

The early identification of signs of PAD in the postpartum period is important for preventive action and intervention to be carried out in order to avoid pelvic floor dysfunction and its negative consequences on the psycho-emotional impact of the affected woman, and the burden on the health system. Physical therapy plays a prominent role in conservative treatment (DUMOULIN *et al, 2014) using resources that improve contraction strength, support, coordination, speed, endurance and PFM functionality (HENDRICK* et al, 1998). Among the methods used by physiotherapy, pelvic floor muscle training (TMAP), biofeedback, electrostimulation, vaginal ball or cone stand out (CITAK *et al*, 2010; HERSCHORN *et al*, 2004).

Currently, it is already known about the important role of physiotherapy and its resources in the process of prevention or rehabilitation of PAD in women who have undergone vaginal births. However, the lack of standardization of treatment protocols leads to gaps in scientific knowledge on this topic. Therefore, it is necessary to understand the best resource to be used, as well as to standardize the protocols successfully in this population, in order to guide future treatments so that they are more assertive regarding the elaboration of the APT.

The primary objective of this review was to assess whether pelvic floor strengthening physiotherapy programmes applied after vaginal delivery affect urinary and sexual function, as well as pelvic floor muscle strength.

2 MATERIALS AND METHODS

This is a systematic review of the effectiveness of the pelvic floor muscle strengthening program of women undergoing vaginal delivery on muscle strength, urinary function, and sexual function. The guidelines of the *Preferred Reporting Items for Systematic Reviews and Meta-Analysis* (PRISMA) (Moher *et al*., 2009) guided the methodology of this study. To search the databases and select the articles, the PICO criteria described below were used:

Q: Primiparous women, who have had a vaginal birth for a maximum of one year.

I: Performing the PFMT alone or in conjunction with other physical therapy resources, such as vaginal balls or cones, electrostimulation and biofeedback after delivery.

C: Comparison will be made with usual care, placebo group, or another form of treatment for pelvic floor strengthening.

O: Pelvic floor muscle strength, sexual function, and urination.

2.1 STRATEGY FOR THE SEARCH AND SELECTION OF STUDIES

The electronic search strategy employed included the following databases: PubMed, Cochrane Central Register of Controlled Trials, PEDro, LILACS, EMBASE, as well as grey literature (Open Grey website). The following terms were synonymous, obtained through *Medical Subject Headings* (MeSH): *postpartum period, pelvic floor, pelvic floor disorders, resistance training, electric stimulation therapy, vaginal cone, sexual dysfunction, urinary incontinence, muscle strength*. There was no restriction on the date of publication of the studies. The last search was conducted in August 2021.

2.2 ELIGIBILITY CRITERIA

The study involved only Randomized Clinical Trials (RCTs) conducted with adult women, up to one year after vaginal delivery, who used as an intervention TMAP, vaginal cones or balls, electrostimulation and biofeedback, in the vaginal postpartum period. In addition, the included studies compared intervention methods to usual care, placebo or another treatment for pelvic floor strengthening.

Protocols, guidelines, abstracts, reviews, and observational studies were excluded; who assessed muscle strength only by electromyography, ultrasound, or anorectal manometry; and those who did not have muscle strength as an outcome.

2.3 DATA EXTRACTION

The studies found in the search were included in the "*Rayyan"* database, used to organize the articles (OZZANI *et al*., 2016). From this program, all abstracts were read by two different and blinded

reviewers (ILGB and MRDZ), who judged the inclusion and exclusion of the studies, following the criteria established above. Two other reviewers (MGB and RBF) were available for conflict resolution.

A standardized form was filled out systematically from the reading of each study, in spreadsheet format, for data extraction, prepared by a reviewer (ILGB) and the veracity of the information verified by a second reviewer (MRDZ) and, when necessary, by a third reviewer (MGB).

2.4 RISK OF BIAS

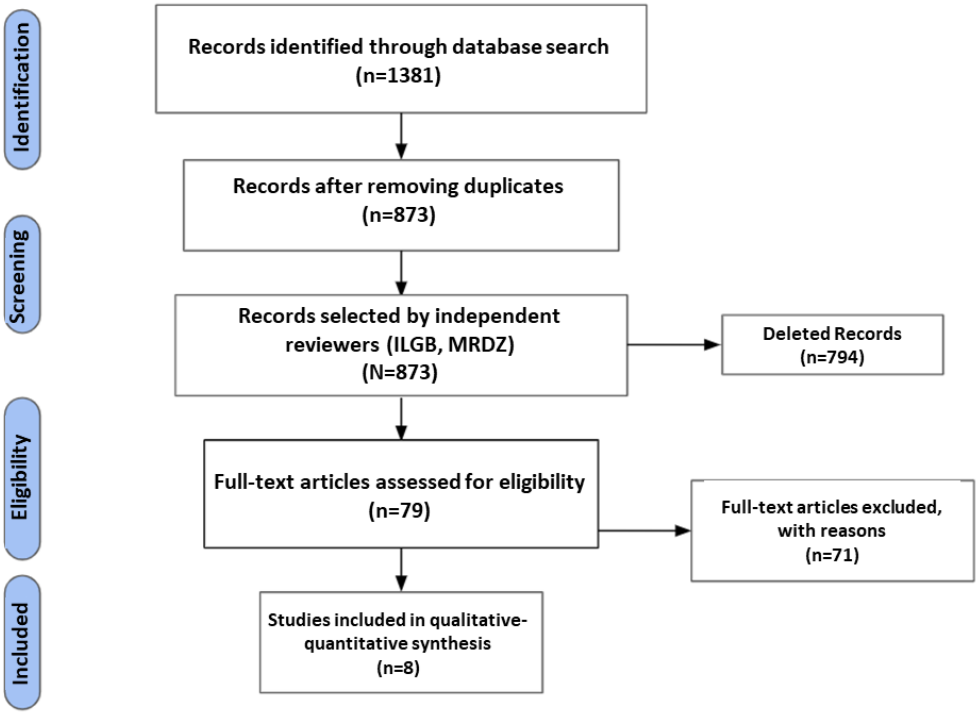
The assessment of the risk of bias was carried out using the PEDro Scale *(Physiotherapy Evidence Database*), by two evaluators (ILGB and MRDZ), independently (DE MORTON, 2009; CASHIN and MCAULEY, 2020) and (MGB) was available for conflict resolution.

3 RESULTS

3.1 SELECTION OF STUDIES

A total of 1,381 articles were identified through database searches. After reading the titles and abstracts, 794 articles were excluded because they involved a different population from the one established for this review; other types of treatments; participants more than one year postpartum; and outcomes that did not address the strength of PFM. Articles that did not present an abstract or were not found in full were also excluded. Thus, 79 studies were included for a complete reading, of which 71 were excluded. As a result, eight RCTs were included in the systematic review (CITAK *et al*., 2010; AHLUND *et al*., 2013; HILDE *et al*., 2013; BØ *et al*., 2015; GOLMAKANI *et al*., 2015; KOLBERG *et al*., 2016; LIN *et al*., 2020; YANG *et al*., 2017). Figure 1 (PRISMA flow diagram) shows the selection process of the included studies.

Figure 1 PRISMA Flow Diagram of the Study Selection Process



3.2 CHARACTERISTICS OF THE STUDIES

The included articles were published between 2010 and 2020 (CITAK *et al*., 2010; AHLUND *et al*., 2013; HILDE *et al*., 2013; BØ *et al*., 2015; GOLMAKANI *et al*., 2015; KOLBERG *et al*., 2016; LIN *et al*., 2020; YANG *et al*., 2017), involving a total of 1,115 participants, with sample sizes ranging from 48 to 189. The duration of the intervention ranged from 8 weeks to 6 months. Five studies compared PFMT with PFMT instructions alone (AHLUND *et al*., 2013; HILDE *et al*., 2013; BØ *et al*., 2015; GOLMAKANI *et al*., 2015; KOLBERG *et al., 2016*) one made the comparison between PFMT and no treatment (CITAK *et al*., 2010); one compared APMT, electrostimulation associated with APMT, and instruction on postpartum routine (YANG *et al*., 2017); and one study compared TMAP, in conjunction with biofeedback and electrostimulation, with instruction on postpartum routine (LIN *et al*., 2020). Chart 1 summarizes the characteristics of the included studies.

Table 1. Characteristics of the included studies

Author, year	Purpose of the study	Participants and population	Intervention and comparison	Initiation of treatment	Handling time	Treatment	Main results
Citak *et al*, 2010	To assess the effect of PFMT on sexual function	Total:118 GC:60 GI:58 Primiparous women, who have not undergone	GI: TMAP GC: No treatment	4th month postpartum	3 months	TMAP: performed at home with 3-second contractions; 10 times a day for 15 days. Progression to	There was a significant difference between the groups in sexual function

		PFMT before or during pregnancy. Age: 19 to 26 years old				up to 10 seconds of contraction, 15 times a day until the end of the study.	and PFM strength in favor of IG.
Ahlund *et al*, 2013	Evaluate the effect of TMAP on PFM strength and UI	Total: 82 GI:40 GC:42 Primiparous women with UI. Age: 29 to 37 years	GI: TMAP GC: Package leaflet	3rd month postpartum	6 months	TMAP: performed at home, in sitting or standing, performing 3 rapid contractions, followed by 3 sets of 8 to 12 slow contractions, held for 6 seconds, daily.	Both groups showed significant improvement in strength, endurance, and UI symptoms.
Hilde *et al,* 2013	Evaluate whether the TMAP decreases the prevalence of UI	Total: 175 GI: 87 GC: 88 Primiparous women. Age: -IG mean 29.8 (SD 4.1) - CG mean: 30.1 (SD 4.0)	GI: TMAP GC: Information leaflet on TMAP, encouraging the performance of the exercise	6th week postpartum	4 months	TMAP: conducted by a physiotherapist, in a group, 1 time a week, for 45 min; and, daily, at home, from 2 to 3 p/day, with 3 sets of 8 to 12 maximal contractions, sustaining for 6 and 8s and, at the end of each contraction, + 3 to 4 rapid contractions, in standing, sitting, lying down, and kneeling positions.	There was no significant difference between the groups.
Bø *et al*, 2014	To evaluate the effect of MAPHT on prevention and treatment of POP	Total: 175 GI: 87 GC: 88 Primiparous women. Age: - IG mean: 29.8 (SD 4.1) - CG mean: 30.1 (SD 4.0)	GI: TMAP GC: Written recommendation to perform PFMT	6th week postpartum	4 months	MPTM conducted by a physiotherapist, in a group, 1 time a week, for 45 min; and daily, at home, 2 to 3 times a day, with 3 sets of 8 to 12 maximal contractions, holding for 6 to 8s and, at the end of each contraction,	There was a significant difference in PFM strength between the groups in favor of IG.

						+ 3 to 4 rapid contractions, in standing, sitting, lying down, and kneeling positions.	
Golmakani *et al*, 2015	To evaluate the effect of MPT on sexual self-efficacy	Total: 104 GI: 52 GC: 52 Primiparous women, who live with their husbands, resuming activity at 8 weeks after vaginal delivery and hassle-free. Age: - CG average: 25.19 (SD3.78) - IG mean: 26.57 (SD 3.92)	GI: TMAP GC: No treatment	8th week postpartum	8 weeks	APT: performed at home, 2 times a day, in the supine position and bent knees, with 4 sets, from 15 to 20 repetitions, sustaining for 5 to 10 seconds and relaxing for 5 to 10 seconds, with an interval 2 min between each set.	There was a significant difference in PFM strength between the groups in favor of IG. There was a significant increase in the mean sexual self-efficacy in both groups, being more significant in the IG.
Kolberg *et al*, 2015	Evaluate the effect of ABPM in vaginal and sexual symptoms, dyspareunia and coital incontinence	Total: 175 GI: 87 GC: 88 Primiparous women. Including I also give birth instrumentalized Age: GI mean: 29.8 (SD 4.1) - CG mean: 30.1 (SD 4.0)	GI: TMAP GC: Package leaflet	6th week postpartum	4 months	APMT, conducted by a physiotherapist, in a group, 1 time a week, for 45 min; and, daily, at home, 2 to 3 times a day, with 3 sets of 8 to 12 maximal contractions, sustaining for 6 and 8s and, at the end of each contraction, + 3 to 4 rapid contractions, in standing, sitting, lying down, and kneeling positions.	Among women with vaginal symptoms, there was a significant increase in the strength and endurance of the PFM, in the IG. There was no significant difference in resting vaginal pressure between the groups.
Yang *et al*, 2017	To evaluate the effect of TMAP	Total: 189 GI1: 63 GI2: 66	GI1: TMAP GI2: PFMT and	2nd day postpartum	3 months	TMAP: performed at home, in the	There was a significant

	combined with electrostimulation on pelvic nerve electrophysiology and tissue function	GC: 60 Primiparous women, with episiotomy or 2nd degree laceration, and who had Episiotomy due to delivery forceps. Age: 20 to 35 years	electrostimulation tion GC: Postpartum routine orientation	(TMAP) and 6th week postpartum (electrostyling) mulation)		supine position, with extended knees, performing the contraction of the hypogastric, perineum and anus muscles, for 5s during inhalation, and relaxing for 5 seconds during expiration, for 20 minutes, 2 to 3 times a day, Electrostimulation: Intravaginal stimulation of low intensity and low frequency, for 30 minutes, 3 times a week.	improvement in UI and PFM strength in IG2
Lin *et al*, 2020	To study the feasibility of PFM rehabilitation after childbirth, as well as its influence on the incidence of SUI	Total: 97 GC:48 GI:49 Primiparous women. Age: 20 to 35 years old	GI: TMAP, intermittent urination exercise, biofeedback, electrostimulation and vaginal cone. GC: Health education	The information was not clear throughout the study	6 months	APT: performed at home, in the supine position, sedation and orthostatism, contracting the anus 6 to 8 seconds during inhalation and relaxing during exhalation, for 30 minutes, 3 times a day. Intermittent urination exercise: stopping or slowing the flow of urine when urinating. Biofeedback and electrostimulation: with high frequency and high intensity, for 30 min2 times a weekVaginal cone: in orthostatism, for 20 min, 1 time a day.	There was a significant improvement in UI in favor of IG.

3.3 ASSESSMENT OF RISK OF BIAS

The results of the risk of bias assessment according to the PEDro Scale (DE MORTON, 2009; CASHIN and MCAULEY, 2020). The scores of the included studies ranged from 4 to 8, and 62.5% of the studies were classified as having good methodological quality (AHLUND *et al*., 2013, HILDE *et al*., 2013, BØ *et al*., 2015, KOLBERG *et al*., 2016, YANG *et al*., 2017).

3.4 OUTCOMES

The main outcomes assessed in the RCTs included in this review were strength and sustaining time of PFM contraction, UI, and sexual function. The evaluation of PFM strength was performed through manometry, with *Camtech devices* (HILDE *et al*., 2013; BØ *et al*., 2015; KOLBERG et al., 2016*), EPI-NO* (CITAK *et al., 2010) and* Peritron *(AHLUND* et al., 2013); and digital palpation, using the Modified Oxford Scale (*CITAK et al*., *2010*; AHLUND *et al*., 2013; YANG et al., 2017*) and the Brink Scale (*GOLMAKANI et al., 2015).

The sustaining time of the contraction was assessed using Camtech devices (HILDE *et al*., 2013; BØ *et al*., 2015; KOLBERG et al., 2016*) and Peritron (*AHLUND et al., 2013). The frequency of UI was assessed using the ICIQ-FLUTS questionnaire (AHLUND et al., 2013) and *ICIQ-UI Short Form questionnaire* (HILDE et al., 2013) and the Pad Test (HILDE et al., 2013; YANG *et al*., 2017).

To assess sexual function, the studies used the ICIQ-VS, ICIQ-FLUTSsex (KOLBERG et al., 2016*), FSFI (*CITAK et al., 2010) questionnaires and the Bailes sexual self-efficacy questionnaire (*GOLMAKANI* et al*., 2015).*

The intervention groups (IG) showed a significant increase in PFM strength when compared to the control groups (CG) in five studies (CITAK *et al*., 2010; BØ *et al*., 2015; GOLMAKANI *et al*., 2015; KOLBERG *et al*., 2016; YANG *et al*., 2017)

Regarding the sustaining of contraction, only one study obtained a result in favor of IG (KOLBERG *et al., 2016); two studies showed a significant improvement in UI in IG (*LIN et al*.,* 2020; YANG *et al*., 2017); and among the three studies that evaluated sexual function, two showed significant improvement in sexual function in IG (CITAK *et al*., 2010; GOLMAKANI *et al*., 2015).

The study conducted by Yang et al (*2017) showed a significant difference between the groups in the outcomes of UI, assessed through the Pad Test (P=0.029) and an unidentified questionnaire (P<0.0001), and PFM strength, assessed through the Modified Oxford Scale, (P<0.0001), in favor of the group associating MAPT and electrotherapy (*YANG et al., 2017).

Citak *et al*. (2010) when assessing the strength of PFM, it was found that the score in both evaluations was higher in the IG (P=0.012; P=0.002, respectively). In the FSFI (Female Sexual Function Index) questionnaire, it was found that the scores of the arousal, lubrication, orgasm and final total domains were significantly higher in the IG, compared to the CG (CITAK *et al*., 2010).

Ahlund *et al (2013) evaluated PFM strength and self-reported UI symptoms and found no significant difference between the groups, although both showed significant improvement comparing the beginning and end of the study (*AHLUND et al*., 2013*).

Kolberg *et al* (2016) used the ICIQ-VS (International Consultation on Incontinence Modular Questionnaire—Vaginal symptoms) and ICIQ-FLUTSsex as methods to assess vaginal symptoms and sexuality; and manometry, through the device *Camtech*, to evaluate the resting pressure, strength and resistance of the PFM. Among women with lesions in the levator ani muscle and vaginal symptoms, there was a significant increase in PFM strength and endurance in favor of IG. There was no significant difference between the groups in sexual function (KOLBERG *et al*., 2016).

The study by Hilde et al (2013*) showed that there was no significant difference between the groups, however, there was a significant improvement in PFM strength and endurance, comparing pre- and post-intervention, in both groups (*HILDE et al*., 2013*). In addition to this study, Bo *et al (2015) found a statistically significant difference in PFM strength in favor of IG (P=0.02) (*BØ et al*., 2015).*

Golmakani *et al* (2015) evaluated the strength of PFM and resulted in a statistically significant difference between the groups in favor of the IG, and, when comparing pre- and post-treatment, the mean sexual self-efficacy increased significantly in both groups. On the other hand, at 8 weeks after the beginning of the study, only the IG showed a significant increase in all aspects of sexual self-efficacy.

Lin et al (2020) *evaluated the strength of PFM and showed no significant difference between the groups, while in relation to UI, there was a significant difference (P<0.001) in favor of IG (LIN et al., 2020).*

4 DISCUSSION

The present study aimed to investigate the physical therapy programs for pelvic floor strengthening applied after vaginal delivery affect urinary and sexual functions, as well as the pelvic floor muscle strength.

Among the RCTs analyzed qualitatively in the present review, most (five) showed statistically significant differences in favor of the intervention group (TMAP) when compared to the control group. Only the study by Ahlund *et al* (2013) found a significant improvement in strength in both groups, with no significant difference between them. The authors explained that the IG's adherence to the treatment, which was performed at home, was not recorded and, therefore, it was not possible to verify whether the participants performed the treatment according to the established exercise protocol. This difference to the other ECAs may have been the control of the performance of the exercises by means of a diary and telephone calls. In addition, the authors also point out that the results may have been influenced by the high level of education and socioeconomic status of the participants in both groups

(AHLUND *et al*., 2013). These two factors should be considered, since they allow easy access to health information and, consequently, to the importance of treatment, favoring women to adhere to the proposed exercises, even when they are in the CG.

Of the three studies that assessed sexual function, only Kolberg *et al* (2016) found no significant difference between the groups after treatment. However, the authors reported that the questionnaires used had not been validated for postpartum women, which is extremely relevant information, as it may have influenced the result (KOLBERG *et al*., 2016).

The systematic review by Hadizadeh-Talasaz *et al* (2019) aimed to verify the effect of PFMT on female sexual function and quality of life after childbirth. The included RCTs had pregnant or postpartum women as participants, with no parity restriction. In total, five RCTs were included in the meta-analysis, which resulted in a statistically significant improvement in sexual function in the groups that underwent APMT. Of the five RCTs, only three were also included in our study (CITAK *et al*., 2010; GOLMAKANI *et al*., 2015; KOLBERG *et al*., 2016), as we chose to include only studies conducted with primiparous women. It is already well known in the literature that, with each pregnancy and delivery, a woman's pelvic floor undergoes extremely relevant overloads and changes (GAO et al, 2022). Thus, when evaluating the effect of MPT in women with different parities, the results could not be considered reliable.

The systematic review by Woodley *et al.* (2020) aimed to evaluate the effects of MPT on the prevention and treatment of UI and FI in pregnant or postpartum women (46 studies). Five articles studied the effect of PFMT with the aim of treating postpartum (GI) UI. Of these, three evaluated UI by means of specific and validated questionnaires (II-Q, UDI; BFLUTS; ICIQ-FLUTS), and one of them also used the tampon test. Among them, two reported improved UI in the IG. The other two studies evaluated UI using a non-specific and validated questionnaire, but both showed improvement in UI in IG. Regarding strength, only four studies evaluated it by manometry or perineometry and only one found a statistically significant improvement in IG compared to CG. Fourteen articles performed PFMT with the aim of preventing and treating UI, of which eleven assessed UI by means of questionnaires, but only two reported improvement in IG. Of these, only four evaluated the strength of PFM using the Oxford Scale, with improvement in favor of IG. The quality of the studies included in the review by Woodley *et al (2020*) ranged from moderate to very low, according to the GRADE system (WOODLEY *et al*., 2020). Two such studies were also included in the present review (HILDE *et al*., 2013; YANG *et al*., 2017). However, all the articles included have moderate to good methodological quality.

The systematic review by Zhu *et al* (2022) aimed to evaluate the efficacy and safety of combined MPT (with biofeedback, electrostimulation, or both) for urinary tract symptoms after childbirth. Through the meta-analysis of five RCTs, they found a significant improvement in PFM

strength, UI, and quality of life in favor of the IG that used combined PFT, compared to the CG, which performed only APT. Unlike this review, Zhu *et al* (2022) included studies that had participants after cesarean delivery, with urinary tract dysfunction and multiparous, which makes it difficult to compare the two studies.

The clinical trials of WANG *et al*. (2020) and ASSIS *et al*. (2013) showed a significant improvement in PFM strength in the intervention group. WANG *et al*. (2020) treated primiparous women with PFMT through an app, and the CG received instruction to perform PFMT at home. In addition to strength, there was also an improvement in sexual function in the IG. In the study by ASSIS *et al*. (2013) the IG performed PFMT and the CG did not receive guidance on exercises. There was also an improvement in UI in the IG.

Both studies could not be included in this review because the first included women who had undergone cesarean section and the second because it was conducted with multiparous women. Cesarean section can be protective of the pelvic floor (SENKAYA *et al*, 2023), which would affect the final result of this musculature positively after exercise, which justifies the importance of involving only women who have undergone the same type of delivery. Although there is a clear definition that the pelvic floor is usually more damaged after the first vaginal delivery (KAMISAN ATAN *et al*, 2018; HORAK *et al*, 2014), it is not known for sure whether the functionality of this musculature can be progressively affected related to the number of vaginal deliveries. However, despite the differences in the populations studied, they also found that PFMT provided increased muscle strength in the GI.

When comparing the duration of PFM strengthening treatment in the studies included in this review, it ranged from 8 weeks to 6 months, i.e., there was no consensus among the authors regarding the appropriate duration for better results. It should be noted that, according to the American College of Sports Medicine (2002), there is a considerable increase in muscle strength between 4 and 8 weeks of a strengthening treatment, considered short-term. On the other hand, in relation to long-term treatments, above 4 months, a periodization of training is necessary, such as a decrease in volume and an increase in intensity, so that it continues to result in muscle strength gain (KRAEMER *et al*., 2002).

In the studies included in this review, we observed that they carried out a long-term treatment program (AHLUND *et al*., 2013; LIN *et al*., 2020), that there was no change in the periodization of training, which probably may have impacted the results, which could have been even better. The heterogeneity of treatments, in relation to frequency, volume, duration, and time after delivery, has a great impact on treatment outcomes and makes it difficult to analyze and compare outcomes (WOODLEY *et al*., 2020; YANG *et al*., 2021).

The studies by Yang et al (2017) and Lin et al (*2020) addressed in the treatment protocol the performance of inspiration associated with PFM contraction and expiration associated with relaxation of this musculature (YANG et al*., *2017*; LIN *et al*., 2020). However, it is known that, physiologically,

PFM presents a greater need for contraction during the exhalation phase, especially when there is a significant increase in intra-abdominal pressure, such as in cases of sneezing, coughing and physical exertion. Thus, the most appropriate and functional for the treatment would be to perform PFM contraction associated with expiration, (TALASZ *et al*., 2010; TALASZ et al*., 2011)* the opposite of what was done in the studies by Yang et al (2017) and Lin et al *(2020).*

Regarding the number of sets and repetitions stipulated for the treatment of GI, Yang *et al (2017), Lin et al (2020) and Citak et al (2010) did not specify (CITAK* et al., 2010 ; YANG *et al*., 2017; LIN *et al*., 2020). The other studies stipulated 2 to 3 sets, with 8 to 12 repetitions, 2 to 3 times a day, with the exception of the study by Golmakani *et al (2015) with 4 sets, 15 to 20 repetitions, 2 times a day (GOLMAKANI* et al., 2015). Among the studies that presented these data, none performed more than 9 sets per day, which is in agreement with the literature, which delimited this number of sets as a safety margin, so that there is no PFM fatigue (GARCÍA-SÁNCHEZ *et al*., 2019).

The major limitation of this review was the absence of data in the results of some studies. In these cases (twelve studies), there was an attempt to contact the authors via e-mail, more than once, to request the data, however, there was no response.

5 CONCLUSION

The PFMT applied to primiparous women up to one year after delivery has been shown to be beneficial in improving the function of the pelvic floor muscles, improving urinary incontinence symptoms and sexual function.

REFERENCES

AALAIE, B.; TAVANA, B.; REZASOLTANI, Z.; AALAEI, S. *et al.* Biofeedback versus electrical stimulation for sexual dysfunction: a randomized clinical trial. Int Urogynecol J, 32, n. 5, p. 1195-1203, May 2021.

ABRAMS, P.; CARDOZO, L.; WEIN, A. 3rd International Consultation on Incontinence--Research Society 2011. Neurourol Urodyn, 31, n. 3, p. 291-292, Mar 2012.

ABRAMS P, Cardozo L, Wagg A, Wein A. Incontinence. 6th International Consultation on Incontinence; Tokyo. 2017. Sep, pp. s. 22pp. 87–88.

AHLUND, S.; NORDGREN, B.; WILANDER, E. L.; WIKLUND, I. et al. Is home-based pelvic floor muscle training effective in treatment of urinary incontinence after birth in primiparous women? A randomized controlled trial. Acta Obstet Gynecol Scand, 92, n. 8, p. 909-915, Aug 2013.

AKSAC, B.; AKI, S.; KARAN, A.; YALCIN, O. et al. Biofeedback and pelvic floor exercises for the rehabilitation of urinary stress incontinence. Gynecol Obstet Invest, 56, n. 1, p. 23-27, 2003.

ASSIS, T. R.; SÁ, A. C.; AMARAL, W. N.; BATISTA, E. M. *et al.* The effect of an exercise program to strengthen pelvic floor muscles in multiparous women. Rev Bras Ginecol Obstet, 35, n. 1, p. 10-15, Jan 2013.

BANKOSKI, A.; HARRIS, T. B.; MCCLAIN, J. J.; BRYCHTA, R. J. *et al.* Sedentary activity associated with metabolic syndrome independent of physical activity. Diabetes Care, 34, n. 2, p. 497-503, Feb 2011.

BARACHO, E. Fisioterapia Aplicada à Saúde da Mulher. Grupo GEN, 2018. 9788527733281.

BERNSTEIN, I. T. The pelvic floor muscles: muscle thickness in healthy and urinary-incontinent women measured by perineal ultrasonography with reference to the effect of pelvic floor training. Estrogen receptor studies. Neurourol Urodyn, 16, n. 4, p. 237-275, 1997.

BLAIVAS, J. G.; SIMMA-CHIANG, V.; GUL, Z.; DAYAN, L. *et al.* Surgery for Stress Urinary Incontinence: Autologous Fascial Sling. Urol Clin North Am, 46, n. 1, p. 41-52, Feb 2019.

BLOMQUIST, J. L.; CARROLL, M.; MUÑOZ, A.; HANDA, V. L. Pelvic floor muscle strength and the incidence of pelvic floor disorders after vaginal and cesarean delivery. Am J Obstet Gynecol, 222, n. 1, p. 62.e61-62.e68, 01 2020.

BØ, K.; HILDE, G.; STÆR-JENSEN, J.; SIAFARIKAS, F. *et al.* Postpartum pelvic floor muscle training and pelvic organ prolapse--a randomized trial of primiparous women. Am J Obstet Gynecol, 212, n. 1, p. 38.e31-37, Jan 2015b.

BRAEKKEN, I. H.; MAJIDA, M.; ELLSTRÖM ENGH, M.; BØ, K. Can pelvic floor muscle training improve sexual function in women with pelvic organ prolapse? A randomized controlled trial. J Sex Med, 12, n. 2, p. 470-480, Feb 2015.

CASHIN, A. G.; MCAULEY, J. H. Clinimetrics: Physiotherapy Evidence Database (PEDro) Scale. J Physiother, v. 66, n. 1, p. 59, 01 2020. ISSN 1836-9561.

CITAK, N.; CAM, C.; ARSLAN, H.; KARATEKE, A. *et al.* Postpartum sexual function of women and the effects of early pelvic floor muscle exercises. Acta Obstet Gynecol Scand, 89, n. 6, p. 817-822, Jun 2010.

CORREIA, G. N.; PEREIRA, V. S.; HIRAKAWA, H. S.; DRIUSSO, P. Effects of surface and intravaginal electrical stimulation in the treatment of women with stress urinary incontinence: randomized controlled trial. Eur J Obstet Gynecol Reprod Biol, 173, p. 113-118, Feb 2014.

CORTON, M. M. Anatomy of pelvic floor dysfunction. Obstet Gynecol Clin North Am, 36, n. 3, p. 401-419, Sep 2009.

DEBEVOISE, T. M. D., ANGELA F.; MCCURDY-ROBINSON, C. B. M., CHRISTINA M. MCNEELY, CODY E. SAUDER, SARA K. SULLIVAN, KIMBERLEE D. Pelvic floor physical therapy: More than Kegels. Women's Healthcare. 3: 34-39 p. 2015.

DE MORTON, N. A. The PEDro scale is a valid measure of the methodological quality of clinical trials: a demographic study. Aust J Physiother, v. 55, n. 2, p. 129-33, 2009. ISSN 0004-9514.

DESILVA, Jeremy M.; ROSENBERG, Karen R. Anatomy, development, and function of the human pelvis. The Anatomical Record, v. 300, n. 4, p. 628-632, 2017.

Dietz HP, Shek KL. Levator defects can be detected by 2D translabial ultrasound. Int Urogynecol J Pelvic Floor Dysfunct. 2009 Jul;20(7):807-11. doi: 10.1007/s00192-009-0839-4. Epub 2009 Mar 17. PMID: 19495542.

DUFOUR, S.; FEDORKOW, D.; KUN, J.; DENG, S. X. et al. Exploring the Impact of a Mobile Health Solution for Postpartum Pelvic Floor Muscle Training: Pilot Randomized Controlled Feasibility Study. JMIR Mhealth Uhealth, 7, n. 7, p. e12587, 07 2019.

DUMOULIN, C.; HAY-SMITH, E. J.; MAC HABÉE-SÉGUIN, G. Pelvic floor muscle training versus no treatment, or inactive control treatments, for urinary incontinence in women. Cochrane Database Syst Rev, n. 5, p. CD005654, May 14 2014.

FELDE, G.; BJELLAND, I.; HUNSKAAR, S. Anxiety and depression associated with incontinence in middle-aged women: a large Norwegian cross-sectional study. Int Urogynecol J, 23, n. 3, p. 299-306, Mar 2012.

GAMEIRO, M. O.; MOREIRA, E. H.; GAMEIRO, F. O.; MORENO, J. C. et al. Vaginal weight cone versus assisted pelvic floor muscle training in the treatment of female urinary incontinence. A prospective, single-blind, randomized trial. Int Urogynecol J, 21, n. 4, p. 395-399, Apr 2010.

GAO, L.; WANG, S.; ZHANG, D.; ZHU, H. *et al.* Pelvic Floor Muscle Strength in the First Trimester of Primipara: A Cross-Sectional Study. Int J Environ Res Public Health, 19, n. 6, Mar 17 2022

GARCÍA-SÁNCHEZ, E.; ÁVILA-GANDÍA, V.; LÓPEZ-ROMÁN, J.; MARTÍNEZ-RODRÍGUEZ, A. *et al.* What Pelvic Floor Muscle Training Load is Optimal in Minimizing Urine Loss in Women with Stress Urinary Incontinence? A Systematic Review and Meta-Analysis. Int J Environ Res Public Health, 16, n. 22, Nov 08 2019.

GOLMAKANI, N.; ZARE, Z.; KHADEM, N.; SHAREH, H. *et al.* The effect of pelvic floor muscle exercises program on sexual self-efficacy in primiparous women after delivery. Iran J Nurs Midwifery Res, 20, n. 3, p. 347-353, 2015 May-Jun 2015.

HADIZADEH-TALASAZ, Z.; SADEGHI, R.; KHADIVZADEH, T. Effect of pelvic floor muscle training on postpartum sexual function and quality of life: A systematic review and meta-analysis of clinical trials. Taiwan J Obstet Gynecol, 58, n. 6, p. 737-747, Nov 2019.

HAN, X.; SHEN, H.; CHEN, J.; WU, Y. Efficacy and safety of electrical stimulation for stress urinary incontinence in women: a systematic review and meta-analysis. Int Urogynecol J, Aug 17 2021.

HANDA, V. L.; BLOMQUIST, J. L.; ROEM, J.; MUÑOZ, A.; DIETZ, HP. Pelvic Floor Disorders After Obstetric Avulsion of the Levator Ani Muscle. Female Pelvic Med Reconstr Surg, 25, n.1, p. 3-7, Jan/Feb 2019.

HANDA, V. L.; BLOMQUIST, J. L.; ROEM, J.; MUÑOZ, A. *et al.* Levator Morphology and Strength After Obstetric Avulsion of the Levator Ani Muscle. Female Pelvic Med Reconstr Surg, 26, n. 1, p. 56-60, Jan/Feb 2020.

HARVEY, M. A. Pelvic floor exercises during and after pregnancy: a systematic review of their role in preventing pelvic floor dysfunction. J Obstet Gynaecol Can, 25, n. 6, p. 487-498, Jun 2003.

HENDRICK, V.; ALTSHULER, L. L.; SURI, R. Hormonal changes in the postpartum and implications for postpartum depression. Psychosomatics, 39, n. 2, p. 93-101, 1998 Mar-Apr 1998.

HERSCHORN, S. Female pelvic floor anatomy: the pelvic floor, supporting structures, and pelvic organs. Rev Urol, 6 Suppl 5, p. S2-S10, 2004.

HIGGINS JPT, THOMAS J, CHANDLER J, CUMPSTON M, LI T, PAGE MJ, WELCH VA (editors). Cochrane Handbook for Systematic Reviews of Interventions version 6.0 (updated July 2019). Cochrane, 2019.

HILDE, G.; STÆR-JENSEN, J.; SIAFARIKAS, F.; ELLSTRÖM ENGH, M. *et al.* Postpartum pelvic floor muscle training and urinary incontinence: a randomized controlled trial. Obstet Gynecol, 122, n. 6, p. 1231-1238, Dec 2013a.

HORAK, T. A.; GUZMAN-ROJAS, R. A.; SHEK, K. L.; DIETZ, H. P. Pelvic floor trauma: does the second baby matter? Ultrasound Obstet Gynecol, 44, n. 1, p. 90-94, Jul 2014.

HOSEINKHANI, M.; TAGHIAN, F. Effects of kegel, central, and combined stability exercises on the central muscle endurance and quality of life of primiparous women after episiotomy. Iranian journal of obstetrics, gynecology and infertility, 21, n. 2, p. 60-68, 2018. Journal: Article.

HWANG, U. J.; LEE, M. S.; JUNG, S. H.; AHN, S. H. et al. Pelvic Floor Muscle Parameters Affect Sexual Function After 8 Weeks of Transcutaneous Electrical Stimulation in Women with Stress Urinary Incontinence. Sex Med, 7, n. 4, p. 505-513, Dec 2019.

KAMISAN ATAN, I.; LIN, S.; DIETZ, H. P.; HERBISON, P. *et al.* It is the first birth that does the damage: a cross-sectional study 20 years after delivery. Int Urogynecol J, 29, n. 11, p. 1637-1643, Nov 2018.

KHAJEHEI, M.; DOHERTY, M.; TILLEY, P. J.; SAUER, K. Prevalence and risk factors of sexual dysfunction in postpartum Australian women. J Sex Med, 12, n. 6, p. 1415-1426, Jun 2015.

KOLBERG TENNFJORD, M.; HILDE, G.; STAER-JENSEN, J.; SIAFARIKAS, F. *et al.* Effect of postpartum pelvic floor muscle training on vaginal symptoms and sexual dysfunction-secondary analysis of a randomised trial. BJOG, 123, n. 4, p. 634-642, Mar 2016b.

KRAEMER, W. J.; ADAMS, K.; CAFARELLI, E.; DUDLEY, G. A. *et al.* American College of Sports Medicine position stand. Progression models in resistance training for healthy adults. Med Sci Sports Exerc, 34, n. 2, p. 364-380, Feb 2002.

LAVERY, J. P.; SHAW, L. A. Sonography of the puerperal uterus. J Ultrasound Med, 8, n. 9, p. 481-486, Sep 1989.

LAWSON, S.; SACKS, A. Pelvic Floor Physical Therapy and Women's Health Promotion. J Midwifery Womens Health, 63, n. 4, p. 410-417, Jul 2018.

LIN, R.; CHEN, X.; JIN, T.; LI, W. *et al.*, 2020, The feasibility of nursing intervention in postpartum pelvic floor muscle rehabilitation among puerperae and its influence on SUI incidence and comprehensive muscle strength. Int J Clin Exp Med, 13, n.6, p. 4571-4579, June 2020.

LIU, Y. J.; WU, W. Y.; HSIAO, S. M.; TING, S. W. *et al.* Efficacy of pelvic floor training with surface electromyography feedback for female stress urinary incontinence. Int J Nurs Pract, 24, n. 6, p. e12698, Dec 2018.

MILSOM, I.; COYNE, K. S.; NICHOLSON, S.; KVASZ, M. *et al.* Global prevalence and economic burden of urgency urinary incontinence: a systematic review. Eur Urol, 65, n. 1, p. 79-95, Jan 2014

MOHER, D.; LIBERATI, A.; TETZLAFF, J.; ALTMAN, D. G. *et al.* Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med, 6, n. 7, p. e1000097, Jul 21 2009.

MØRKVED, S.; BØ, K. The effect of postpartum pelvic floor muscle exercise in the prevention and treatment of urinary incontinence. Int Urogynecol J Pelvic Floor Dysfunct, 8, n. 4, p. 217-222, 1997.

MULIC-LUTVICA, A.; EURENIUS, K.; AXELSSON, O. Longitudinal study of Doppler flow resistance indices of the uterine arteries after normal vaginal delivery. Acta Obstet Gynecol Scand, 86, n. 10, p. 1207-1214, 2007.

ÖZDEMIR, Ö.; BAKAR, Y.; ÖZENGIN, N.; DURAN, B. The effect of parity on pelvic floor muscle strength and quality of life in women with urinary incontinence: a cross sectional study. J Phys Ther Sci, 27, n. 7, p. 2133-2137, Jul 2015b.

ÖZLÜ, A.; YILDIZ, N.; ÖZTEKIN, Ö. Comparison of the efficacy of perineal and intravaginal biofeedback assisted pelvic floor muscle exercises in women with urodynamic stress urinary incontinence. Neurourol Urodyn, 36, n. 8, p. 2132-2141, Nov 2017.

OZZANI, M.; HAMMADY, H.; FEDOROWICZ, Z.; ELMAGARMID, A. Rayyan – a web and mobile app for systematic reviews. Syst Rev. 2016;5(1):210.

PALMER, M. H. Pelvic muscle rehabilitation: where do we go from here? J Wound Ostomy Continence Nurs, 24, n. 2, p. 98-105, Mar 1997.

PEREIRA, V. S.; DE MELO, M. V.; CORREIA, G. N.; DRIUSSO, P. Long-term effects of pelvic floor muscle training with vaginal cone in post-menopausal women with urinary incontinence: a randomized controlled trial. Neurourol Urodyn, 32, n. 1, p. 48-52, Jan 2013.

PREDA, A.; MOREIRA, S. [Stress Urinary Incontinence and Female Sexual Dysfunction: The Role of Pelvic Floor Rehabilitation]. Acta Med Port, 32, n. 11, p. 721-726, Nov 04 2019.

RADZIMIŃSKA, A.; STRĄCZYŃSKA, A.; WEBER-RAJEK, M.; STYCZYŃSKA, H. *et al.* The impact of pelvic floor muscle training on the quality of life of women with urinary incontinence: a systematic literature review. Clin Interv Aging, 13, p. 957-965, 2018.

REZAEI, N.; AZADI, A.; SAYEHMIRI, K.; VALIZADEH, R. Postpartum Sexual Functioning and Its Predicting Factors among Iranian Women. Malays J Med Sci, 24, n. 1, p. 94-103, Mar 2017.

RIKARD-BELL, J.; IYER, J.; RANE, A. Perineal outcome and the risk of pelvic floor dysfunction: a cohort study of primiparous women. Aust N Z J Obstet Gynaecol, 54, n. 4, p. 371-376, Aug 2014.

SENKAYA, A. R.; ISMAILOGLU, E.; ARI, S. A.; KARACA, I. How does the type of delivery affect pelvic floor structure? MRI parameter-based anatomical study. Ginekol Pol, 94, n. 1, p. 57-63, 2023.

SILVA, M.P.P.E.; MARQUES, A.D.A.; AMARAL, M.T.P.D. Tratado de Fisioterapia em Saúde da Mulher, 2ª edição. Grupo GEN, 2018. 9788527734660.

SINCLAIR, A.; RAMSAY, I. The psychosocial impact of urinary incontinence in women. The Obstetrician & Gynaecologist, 13, 2011.

TALASZ, H.; KOFLER, M.; KALCHSCHMID, E.; PRETTERKLIEBER, M. *et al.* Breathing with the pelvic floor? Correlation of pelvic floor muscle function and expiratory flows in healthy young nulliparous women. Int Urogynecol J, 21, n. 4, p. 475-481, Apr 2010.

TALASZ, H.; KREMSER, C.; KOFLER, M.; KALCHSCHMID, E. *et al.* Phase-locked parallel movement of diaphragm and pelvic floor during breathing and coughing-a dynamic MRI investigation in healthy females. Int Urogynecol J, 22, n. 1, p. 61-68, Jan 2011.

The Global Forum on Incontinence *About incontinence.* [Acesso em 6 de fevereiro de 2022]. Disponível em: http://www.gfiforum.com/incontinence.

TIBAEK, S.; DEHLENDORFF, C. Pelvic floor muscle function in women with pelvic floor dysfunction: a retrospective chart review, 1992-2008. Int Urogynecol J, 25, n. 5, p. 663-669, May 2014.

VAN DE WAARSENBURG, M. K.; VERBERNE, E. A.; VAN DER VAART, C. H.; WITHAGEN, M. I. J. Recovery of puborectalis muscle after vaginal delivery: an ultrasound study. Ultrasound Obstet Gynecol, 52, n. 3, p. 390-395, Sep 2018.

VANREES, D.; BERNSTINE, R. L.; CRAWFORD, W. Involution of the postpartum uterus: an ultrasonic study. J Clin Ultrasound, 9, n. 2, p. 55-57, Feb 1981.

WANG, X.; XU, X.; LUO, J.; CHEN, Z. *et al.* Effect of app-based audio guidance pelvic floor muscle training on treatment of stress urinary incontinence in primiparas: A randomized controlled trial. Int J Nurs Stud, 104, p. 103527, Apr 2020.

WANG Z, ZAN X, LI Y, LU Y, XIA Y, PAN X. Comparative efficacy different resistance training protocols on bone mineral density in postmenopausal women: A systematic review and network meta-analysis. Front Physiol, 2023.

WEI, J. T.; DE LANCEY, J. O. Functional anatomy of the pelvic floor and lower urinary tract. Clin Obstet Gynecol, 47, n. 1, p. 3-17, Mar 2004.

WOODLEY, S. J.; LAWRENSON, P.; BOYLE, R.; CODY, J. D. *et al.* Pelvic floor muscle training for preventing and treating urinary and faecal incontinence in antenatal and postnatal women. Cochrane Database Syst Rev, 5, n. 5, p. CD007471, May 06 2020.

WU, X.; ZHENG, X.; YI, X.; LAI, P. *et al.* Electromyographic Biofeedback for Stress Urinary Incontinence or Pelvic Floor Dysfunction in Women: A Systematic Review and Meta-Analysis. Adv Ther, 38, n. 8, p. 4163-4177, 08 2021.

YANG, S.; SANG, W.; FENG, J.; ZHAO, H. *et al.* The effect of rehabilitation exercises combined with direct vagina low voltage low frequency electric stimulation on pelvic nerve electrophysiology and tissue function in primiparous women: A randomised controlled trial. J Clin Nurs, 26, n. 23-24, p. 4537-4547, Dec 2017.

YANG, X.; ZHANG, A.; SAYER, L.; BASSETT, S. *et al.* The effectiveness of group-based pelvic floor muscle training in preventing and treating urinary incontinence for antenatal and postnatal women: a systematic review. Int Urogynecol J, Aug 28 2021.

YUVARANI, G.; HIMA BINDU DAGGUMATI; RAMACHANDRAN, S.; SUDHAKAR, S. The effect of tRa training and pilates in women with stress urinary incontinence. Biomedicine, 38, n. 3, p. 404-407, Jul 2018

ZHU, D.; XIA, Z.; YANG, Z. Effectiveness of physiotherapy for lower urinary tract symptoms in postpartum women: systematic review and meta-analysis. Int Urogynecol J, 33, n. 3, p. 507-521, Mar 2022.

ZUCHELO, L. T. S.; BEZERRA, I. M. P.; DA SILVA, A. T. M.; GOMES, J. M. *et al.* Questionnaires to evaluate pelvic floor dysfunction in the postpartum period: a systematic review. Int J Womens Health, 10, p. 409-424, 2018.

SEVEN publicações acadêmicas

Management of obesity in prader-willi syndrome

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ABSTRACT

Introduction: Obesity is a significant health concern in individuals with Prader-Willi Syndrome (PWS), a rare genetic condition characterized by insatiable appetite. This study aims to address obesity in PWS, understanding the management strategies and their impact on the health of these patients. Objectives: The objective of this research is to evaluate therapeutic approaches and their outcomes in the treatment of obesity in individuals with Prader-Willi Syndrome. Additionally, we seek to understand how these interventions affect the overall quality of life and health of the patients. Methodology: A comprehensive review of medical literature related to obesity in Prader-Willi Syndrome was conducted. Clinical studies, systematic reviews, and case reports describing dietary, behavioral, and medical interventions used in the treatment of obesity in PWS patients were analyzed. Results: The results underscore the importance of a multidisciplinary approach in the treatment of obesity in Prader-Willi Syndrome. Restrictive dietary interventions, regular medical monitoring and adapted physical activity have proven effective in weight management. Furthermore, early intervention plays a crucial role in the successful management of obesity. Conclusion: Obesity in Prader-Willi Syndrome presents a complex challenge, but with the right approach, positive outcomes are achievable. Personalized treatment, taking into consideration the individual needs of each patient, is essential. Managing obesity in PWS not only improves physical health but also contributes to enhancing the quality of life for these individuals and their families.

Keywords: Prader-Willi Syndrome, Obesity, Management.

1 INTRODUCTION

Prader-Willi Syndrome is a rare genetic pathology that affects several systems of the body. It is caused, in approximately 60% of cases, by the loss of gene expression of the paternal chromosome 15q11-q13. In even rarer cases, approximately 35% of cases, it may be caused by a maternal

uniparental disomy of chromosome 15. The prevalence of the syndrome is 1/15,000 live births, affecting boys and girls equally, and with no predilection for ethnicity or groups. (Aguiar *et al.*, 2022; Goulart *et al.*, 2021)

The clinical picture is characterized by two distinct clinical phases. In the first phase, the child presents neonatal hypotonia, lethargy, difficulty sucking, weak crying, and hyporeflexia in the neonatal period. After the first 6 months of age, hypotonia improves and the child begins to present dyspnea and apnea during sleep, leading to significant sleepiness, moderate to severe mental retardation associated with learning disorders, short stature due to growth hormone deficiency, hypogonadism that predisposes to a deficiency in sexual development and increased appetite leading to obesity. Hyperphagia is the most pronounced symptom of the syndrome. Associated with the improperly reduced use of ingested calories, the voluminous intake of food contributes to intense sleepiness, increasing the chances of the child developing severe obesity. (Junior *et al,* 2005; Holm *et al.* 1993)

Obesity is a chronic metabolic condition that develops due to the excessive accumulation of adipose tissue in the body, caused by the combination of exogenous factors, such as hypercaloric diets associated with a sedentary lifestyle, and endogenous factors, such as alterations in specific genes (Zubrzycki *et al.*, 2018). It is an important factor in the development of type 2 diabetes mellitus (DM2) and carries additional health risks, since the high body mass index is related to increased cardiovascular risk and, consequently, morbidity and mortality (Borgundvaag; Mak; Kramer, 2020).

The cause of obesity in PWS is intrinsically linked to dysregulated appetite, a central feature of the syndrome. Affected individuals experience a constant feeling of hunger, which leads to an excessive consumption of food and, consequently, weight gain. In addition, reduced metabolic rate in people with PWS contributes to the tendency toward obesity. These factors combined make obesity one of the main morbidities in this syndrome, increasing the risk of serious health problems such as diabetes, heart problems, and sleep apnea. (Bellis *et al.*, 2022)

Effective management of obesity in PWS is of critical importance, since obesity can further aggravate already present health complications. Intervention should be started early, ideally in childhood, to maximize benefits and minimize risks associated with obesity. The health care team that deals with patients with PWS should consist of professionals from a variety of specialties, including physicians, nutritionists, psychologists, occupational therapists, and physical therapists. The approach should be tailored to the individual needs of each patient, taking into account factors such as age, severity of obesity, associated medical conditions, and medical history. (Muscogiuri *et al.*, 2019)

A key part of obesity management in PWS is a restricted and controlled diet. Calories ingested should be strictly monitored and controlled to prevent excessive weight gain. However, this dietary restriction should not be excessive, since it can lead to obsessive behaviors towards food. Therefore,

careful supervision by a dietitian is crucial to balance calorie restriction with basic nutritional need. (Mackenzie *et al.*, 2018)

In addition to diet, behavioral therapy plays an essential role in the management of obesity in PWS. Patients and their families must learn strategies to cope with insatiable appetite and food urges. This includes developing self-regulation and control skills, as well as identifying triggers that trigger excessive food consumption. (Tan *et al*., 2020)

Adapted physical activity is another key component in the management of obesity in patients with PWS. Due to the hypotonia characteristic of the syndrome, physical activity should be adapted to individual capacities, with a focus on improving muscle strength and promoting mobility. Targeted and supervised exercise programs can be beneficial for avoiding a sedentary lifestyle and contributing to weight management. (Bellicha *et al.*, 2021)

2 OBJECTIVE

This study aims to address the management of obesity in people with Prader-Willi Syndrome and its nuances, since it is a condition characterized by significant hyperphagia and metabolic dysfunctions.

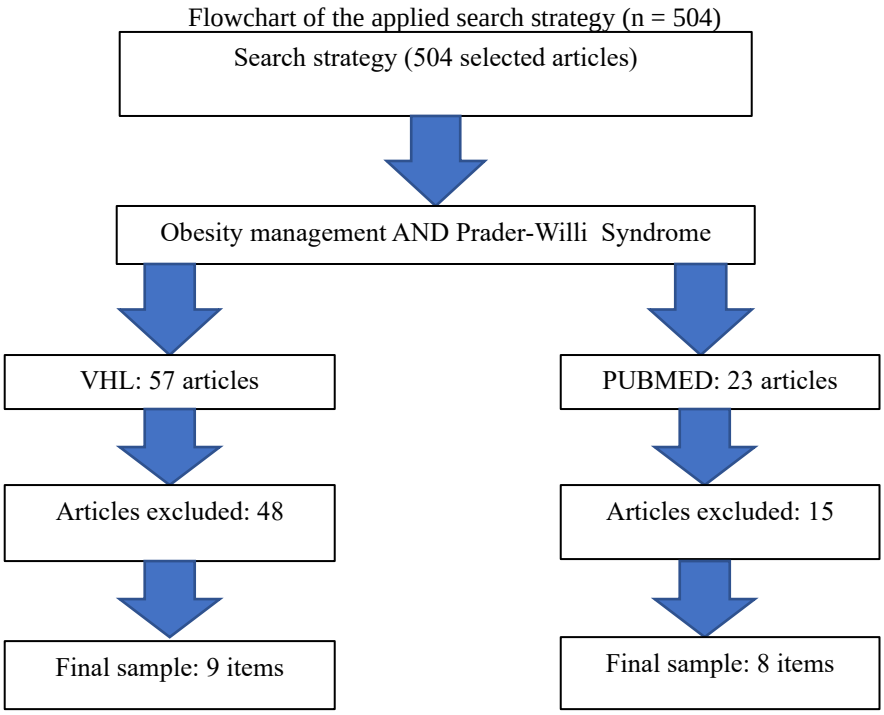
3 MATERIALS AND METHODS

The present study is an integrative literature review that enables the search, critical evaluation and synthesis of available evidence on the investigated topic. In the first stage, the following guiding question was asked: "How to manage obesity in patients with Prader-Willi Syndrome?".

Then, in the second stage, in October 2023, the scientific search was carried out through the PubMed and VHL platforms, using the following descriptors indexed in the Health Sciences Descriptors (DeCS): "*obesity management" and "*Prader-Willi syndrome"*, which were gathered using the Boolean descriptor AND.*

Regarding the inclusion criteria for the selection of articles, the following were established: articles published in the last five years, available as full text and in English or Portuguese.

Initially, 504 studies were found based on the use of the descriptors in the databases, 33 in PubMed, 445 in Medline, 11 in the Latin American and Caribbean Health Sciences Literature (LILACS), 11 in the Index Medicus for the Western Pacific (WPRIM) and 4 in the Bibliographic Index Español en Ciencias de la Salud (IBECS). After applying the inclusion and exclusion criteria, 80 studies were selected; these were screened considering the reading of the title and keywords, and 28 studies were considered in the next stage of selection. Then, 4 were excluded due to duplicity, leaving 24 papers to be read and, of these, 22 underwent a full analysis and 17 investigations made up the final sample.



Finally, a data collection form was used for the critical analysis of the studies, consisting of the following information: title, authors, year, place of execution of the study, sample, objective, design, and main results (Pinheiro *et al.*, 2021). The selection of articles was carried out independently by three authors and there was no disagreement regarding the selected works.

4 RESULTS

The studies analyzed were published between 2018 and 2023 and conducted in Brazil, France, Italy, Canada, the United States, China, and Australia. Regarding the methodological approach, the studies were literature review (n=12, 70%); double-blind randomized clinical trial (n=1; 6%); non-randomized clinical trial (n=3; 18%) and retrospective cohort (n=1; 6%). Adults and children participated in the study, either by undergoing interventions or by composing, quantitatively, the results in the literature reviews. (Chart 1).

Table 1 – Characteristics of the selected studies. (n=17).

Author and year	Outline	Objective	Sample & Scenario	Main results
Alves; Franco, 2020	Literature review	To update on the endocrinological aspects of PWS considering diagnosis and treatment.	Not applicable	Not applicable
Diene *et al.*, 2022	Double-blind randomized clinical trial	To determine whether pharmacological treatment with liraglutide is superior or not to	52-week clinical trial with a 16-week double-blind period. The sample consisted of 31 adolescents between	There were no significant differences in BMI between the adolescent group and the adult group.

		placebo in paediatric patients with PWS.	12 and 17 years old and 24 children between 6 and 11 years old with PWS and obesity. Liraglutide was administered 3mg in one group and placebo in the other group.	
Crinò *et al.*, 2018	Literature review	To analyze therapeutic options for PWS, including pharmacological and surgical interventions.	Not applicable.	Not applicable
Miller; Tan, 2020	Literature review	Address the main forms of non-pharmacological management of PWS	Not applicable.	Not applicable.
Barrea *et al.*, 2022	Literature review	Update on the main forms of pharmacological and non-pharmacological management of PWS	Not applicable.	Not applicable.
Calcaterra *et al*., 2023	Literature review	Dissertation on the main ways to prevent hyperphagia and obesity in PWS.	Not applicable.	Not applicable.
Wolfe *et al.*, 2023	Literature review	To define the change in BMI resulting from the main bariatric surgeries: Laparoscopic sleeve gastrectomy, gastric bypass, and biliopancreatic diversion.	Not applicable.	Not applicable.

Bellicha *et al.*, 2021	Literature review	To describe sedentary behavior and level of physical activity in children and adults with PWS; Analyze their relationships with their health levels and physical compositions.	Not applicable.	Not applicable.
Éva erhardt; Dénes molnár, 2022	Literature review	To summarize the current knowledge about the dietary management and treatment of PWS for the prevention of excessive weight gain.	Not applicable.	Not applicable.
Nolan; Proietto; Sumithran, 2022	Retrospective cohort	To examine the efficacy, safety, and tolerability of interventions that cause sudden weight loss in PWS patients.	18 individuals with PWS (13 with obesity). Average weight of 97kg and average BMI of 41kg/m2. The work took place at Austin Hospital in Melbourne, Australia.	There was significant weight loss and BMI improvement in all participants.
BELLIS *et al.*, 2022	Literature review	To quantify the type and severity of hyperphagia-related morbidity and mortality in PWS patients.	Not applicable.	Not applicable.
Li et al., 2021	Non-randomized clinical trial	OBJECTIVE: To analyze the relationship between diets with high dietary fiber content and improved quality of life standards in PWS patients.	Children with nonsyndromic obesity (n=19) and children with PWS (n=17) underwent dietary protocols at a children's hospital in Guangdong for 30-90 days.	The dietary intervention caused important positive changes in the gut microbiota of both groups.

Muscogiuri *et al.*, 2019	Literature review	Provide an up-to-date overview of the endocrine and metabolic complications of PWS.	Not applicable.	Not applicable.
Tan *et al.*, 2020	Literature review	To provide an evidence-based update on treatment options for hyperphagia and obesity in PWS patients.	Not applicable.	Not applicable.
Rubin *et al.*, 2018	Non-randomized clinical trial	To determine whether participation in 24 weeks of physical activity causes positive cardiometabolic changes in children with PWS and non-PWS.	18 children with PWS (aged between 9.8 and 11.2 years), perceived fat between 42.6% and 46.6% and 30 children with non-syndromic obesity (between 9.5 and 9.9 years of age). They underwent a 24-week physical activity program.	All children in the study showed a reduction in inflammatory markers, improvement in HOMA-IR parameters, and improvement in HDL levels.
Mackenzie *et al.*, 2018	Non-randomized clinical trial	OBJECTIVE: To estimate the intake of essential nutrients and the dietary quality of young people with PWS in relation to young people who do not have the syndrome.	23 young people with PWS and 23 young people who do not have PWS. Food intake was controlled.	The two groups had similar results, with substantial improvement in body composition.
Muscogiuri *et al.*, 2021	Literature review.	To provide an up-to-date perspective on obesity in PWS, from a pathophysiological point of view to the complications resulting from obesity and conservative management.	Not applicable.	Not applicable.

Due to the limited volume of randomized and non-randomized clinical trials and adequate prospective and retrospective cohort studies in the main databases evaluated, literature reviews were included in the study sample. This is mainly due to the promotion of counterpoints and discussion of biases that will be addressed in the discussion of the work.

5 DISCUSSION

Obesity in individuals with Prader-Willi Syndrome has characteristics that are not common to simple obesity. In fact, lean mass is lower in individuals with PWS than in normal-weight people and even lower than in obese individuals. The decrease in muscle mass is responsible for the reduction in resting energy expenditure (REE), but a normal ratio of fat-free mass to REE is maintained in individuals with PWS. That is, adults and children with PWS accumulate more adipose tissue due to the low amount of musculoskeletal mass. Typically, obesity in PWS affects the trunk and proximal extremities of the limbs. Differently from what occurs in non-syndromic obesity, individuals with PWS have a lower ratio between trunk and limb fat mass, as well as lower visceral adiposity. In addition, patients with PWS have a higher insulin sensitivity compared to obese patients who do not have the syndrome. (Crinó *et al.*, 2018)

Obesity in Prader-Willi Syndrome presents nuances that make the management of the condition more complex compared to obese patients who do not have the clinical condition. Hypogonadism and growth hormone (GH) deficiency are the most prominent problems involved (Muscogiuri *et al.*, 2019). Girls with PWS may have hypoplasia of the labia minora and clitoris. They are usually fertile and, therefore, contraceptive methods should be indicated. Boys usually have cryptochidisa, hypoplastic scrotum, micropenis, and are often infertile. For boys, the use of human chorionic gonadotropin (hCG) may be an option while still a child. From the age of 14, the use of testosterone as a form of hormone replacement therapy (HRT) is a viable option. For cryptokyrdia, orchidopexy in the first years of life. For girls, the use of combined oral or transdermal contraception is indicated. (Alves; Franco, 2020)

Short stature is common in Prader-Willi syndrome, and without growth hormone replacement, the final average height is 155-160 cm for men and 145-150 cm for women. Younger children may have a normal reserve of growth hormone in the pituitary gland, but are deficient in hypothalamic secretion of GH-releasing hormone. As these children grow, they can deplete this GH reserve and become disabled. Growth hormone (GH) replacement therapy results in less decline in IQ scores with age. Despite the recommendation to start rhGH replacement in PWS in an average of 7 years, rhGH treatment has been indicated earlier. The benefits of rhGH treatment starting at 4-6 months of age have already been demonstrated. Recent studies have shown positive effects on neurocognitive and behavioral development when rhGH treatment is started before 2 years of age. (Alves; Franco, 2020; Muscogiuri *et al.*, 2019)

During early childhood, individuals with Prader-Willi Syndrome (PWS) experience hypotonia, feeding difficulties, and a drastically decreased appetite. It is often necessary to monitor feeding in the first months of life due to failure to gain weight. From 9 to 25 months of age, appetite improves, and these babies grow steadily along the growth curve with a normal diet. In early childhood, they experience rapid weight gain with no change in appetite (still age-appropriate). However, in the next phase, excessive weight gain continues and appetite increases; Obesity usually develops if eating is not controlled externally. From the age of 8, individuals with PWS often develop an insatiable and uncontrollable desire to consume food, called hyperphagia, accompanied by an absence of satiety. Individuals with PWS require supervision to prevent choking and binge eating, which can lead to stomach rupture, gastric necrosis, and death. Overeating can result in severe obesity. (Tan *et al.*, 2020; Bellis *et al.*, 2022)

Regarding the dietary management of obesity in Prader-Willi Syndrome, several approaches have been studied and analyzed for their efficacy in reducing morbidity and mortality associated with the condition. In this vein, the studies by Hui *et al*. (2021) and Calcaterra *et al.* (2023) drew contrasting conclusions. Hui *et al*. (2021) described that a high-fiber dietary intervention can suppress inflammation in obese children, which can be attributed to modulating the structure of the gut microbiota. The investigation of virulence genes (VF) carried out in the current study suggests that the intervention decreased the inflammatory state in obese children with PWS and obese children without the condition. Calcaterra *et al.* (2023), on the other hand, described that the best nutritional strategy for these patients is a well-balanced, low-calorie diet, as there are currently no specific recommendations that suggest accurate carbohydrate, protein, or fiber intake for children with PWS. The paper written by Hui *et al*. (2021) presents a higher level of evidence, but has a small sample and short follow-up time, thus making it difficult to interpret the facts.

A Mediterranean-type dietary composition, which includes fiber-rich carbohydrates, dairy, healthy fats, and protein, can limit the need for significant calorie restriction while providing adequate sources of energy for growth, exercise, and improved muscle mass. Thus, currently, the best nutritional strategy in individuals with PWS seems to be a balanced, low-calorie diet. Supplements may be necessary to meet micronutrient recommendations in young people who are unable to achieve them through food and beverage intake alone. (Mackenzie *et al.,* 2018; Miller; Tan, 2020; Muscogiuri *et al.*, 2021)

Obese children and adults with PWS have a lower level of physical activity when compared to obese individuals who do not have the condition. Ideally, due to the smaller amount of musculoskeletal mass, patients with the syndrome should perform combined aerobic and anaerobic activities (Bellicha *et al.*, 2021). On the other hand, participation in a 24-week physical activity routine did not increase levels of moderate-to-vigorous physical activity (MVPA), which is primarily associated with

improvement in metabolic factors or a reduction in body fat. To elucidate whether the changes observed in the results were related to body fat, analyses were performed on a subsample of children who had body fat gain equal to or less than zero percent. Participants showed significant small to moderate improvements in some cardiometabolic and inflammatory factors (HDL, HOMA-IR, and IL8), with some improvements becoming statistically significant when children showed body fat gain equal to or less than zero percent (HOMA-IR and HDL). (Rubin *et al.*, 2018)

As pharmacological interventions, several options are feasible for weight gain control and obesity management. The main drugs for this purpose are: topiramate, metformin, naltrexone + bupropion and GLP-1 agonists, each medication with its own particularity and contraindication. Topiramate is an antiepileptic drug with off-label use for weight reduction. Its mechanism is not fully understood, but it appears to block sodium and calcium channels, enhancing the suppression effects of GABA. An open-label study of seven patients with PWS demonstrated weight reduction or decreased weight gain and improved mood. Metformin is a classic oral medication for the treatment of type 2 diabetes by improving hyperglycemia and is also used off-label to treat obesity and prediabetes. Naltrexone-bupropion is a combination drug used to treat obesity and impulsive behavior. Naltrexone is an opioid receptor antagonist, and bupropion is a dopamine/norepinephrine reuptake inhibitor. The glucagon-like peptide-1 receptor (GLP-1) agonist stimulates insulin release, inhibits glucagon secretion, and decreases plasma ghrelin levels. Studies indicate increased satiety after meals in patients with PWS. (Barrea *et al.*, 2022; Éva Erhardt; Dénes Molnár, 2022; Nolan; Proietto; Sumithran, 2022)

Liraglutide (GLP-1 analogue) has been shown to reduce BMI in children and adolescents with PWS and obesity. However, there were no significant differences between the children and adolescents who received liraglutide and those who received placebo or no treatment. This was probably due to a hypothalamic dysfunction characteristic of the syndrome, but which still needs further studies to be elucidated. (Diene *et al.*, 2022)

Surgical interventions offer important control of hyperphagia, significant short- and long-term weight loss, minimal rates of surgical complications, and low but manageable nutritional risks. Laparoscopic Sleeve Gastrectomy (LSG) seems to address several of these aspects, however, a significant decrease in BMI, due to surgery, may not be sustained after 3 years. Therefore, Biliopancreatic Shunt (BPD) or Biliopancreatic Shunt with Duodenal Shunt (BPD-DS) surgery can maintain a significant reduction in BMI for up to 10 years, but requires greater adherence to nutritional supplementation. (Wolfe *et al.*, 2023)

6 CONCLUSION

The management of obesity in Prader-Willi Syndrome (PWS) is a complex and challenging task that requires a multidisciplinary and personalized approach. Obesity is a prevalent concern for

individuals affected by PWS, due to the insatiable appetite that characterizes this genetic condition. As demonstrated throughout this study, several interventions are possible and feasible for the prevention and treatment of obesity in individuals with the syndrome.

The controlled diet, although challenging, is one of the pillars of treatment, maintaining the balance between the necessary calorie restriction and the promotion of a healthy relationship with food. Behavioral therapy plays an equally crucial role in empowering patients and their families to cope with insatiable appetite and food urges.

In addition, adapted physical activity, designed to meet the specific capabilities of each patient, contributes to the improvement of muscle strength and mobility, avoiding a sedentary lifestyle and helping to control weight.

REFERENCES

ALVES, C.; FRANCO, R. R. Prader-Willi syndrome: endocrine manifestations and management. Archives of Endocrinology and Metabolism, v. 64, n. 3, p. 223–234, 2020.

BARREA, L. et al. Prader–Willi Syndrome in Adults: An Update On Nutritional Treatment and Pharmacological Approach. Current Obesity Reports, v. 11, n. 4, p. 263–276, 5 set. 2022.

BELLICHA, A. et al. Physical Activity in Patients with Prader-Willi Syndrome—A Systematic Review of Observational and Interventional Studies. Journal of Clinical Medicine, v. 10, n. 11, p. 2528, 7 jun. 2021.

BELLIS, S. A. et al. The consequences of hyperphagia in people with Prader-Willi Syndrome: A systematic review of studies of morbidity and mortality. European Journal of Medical Genetics, v. 65, n. 1, p. 104379, 1 jan. 2022.

BORGUNDVAAG, E.; MAK, J.; KRAMER, C. K. Metabolic Impact of Intermittent Fasting in Patients With Type 2 Diabetes Mellitus: A Systematic Review and Meta-analysis of Interventional Studies. The Journal of Clinical Endocrinology & Metabolism, v. 106, n. 3, 15 dez. 2020.

CALCATERRA, V. et al. Prader–Willi Syndrome and Weight Gain Control: From Prevention to Surgery—A Narrative Review. Children, v. 10, n. 3, p. 564, 1 mar. 2023.

CRINÒ, A. et al. Obesity management in Prader–Willi syndrome: current perspectives. Diabetes, Metabolic Syndrome and Obesity: Targets and Therapy, v. 11, n. 2018, p. 579–593, 4 out. 2018.

DE FRANÇA, A. et al. SÍNDROME DE PRADER WILLI: RELATO DE CASO Prader-Willi Syndrome: a Case Report. [s.l: s.n.]. Disponível em: <https://www.revistacirurgiabmf.com/2006/v6n1/pdf%20v6n1/5.pdf>.

DIENE, G. et al. Liraglutide for Weight Management in Children and Adolescents With Prader–Willi Syndrome and Obesity. The Journal of Clinical Endocrinology & Metabolism, v. 108, n. 1, 1 out. 2022.

ÉVA ERHARDT; DÉNES MOLNÁR. Prader–Willi Syndrome: Possibilities of Weight Gain Prevention and Treatment. Nutrients, v. 14, n. 1950, p. 1950–1950, 1 maio 2022.

GOULART, K. C. F. et al. Síndrome de Prader-Willi/ Prader-Willi syndrome. Brazilian Journal of Health Review, v. 4, n. 5, p. 21636–21643, 13 out. 2021.

HOLM, V. A. et al. Prader-Willi Syndrome: Consensus Diagnostic Criteria. Pediatrics, v. 91, n. 2, p. 398–402, 1 fev. 1993.

LEMES AGUIAR, D. et al. CARACTERIZAÇÃO DAS MANIFESTAÇÕES CLÍNICAS DA SÍNDROME DE PRADER-WILLI E TRATAMENTOS: UMA REVISÃO INTEGRATIVA DE LITERATURA. RECIMA21 - Revista Científica Multidisciplinar - ISSN 2675-6218, v. 3, n. 3, p. e331199, 2 mar. 2022.

LI, H. et al. Suppressed inflammation in obese children induced by a high-fiber diet is associated with the attenuation of gut microbial virulence factor genes. Virulence, v. 12, n. 1, p. 1754–1770, 8 jul. 2021.

MACKENZIE, M. L. et al. Dietary intake in youth with prader-willi syndrome. American Journal of Medical Genetics. Part A, v. 176, n. 11, p. 2309–2317, 1 nov. 2018.

MILLER, J. L.; TAN, M. Dietary Management for Adolescents with Prader–Willi Syndrome. Adolescent Health, Medicine and Therapeutics, v. Volume 11, p. 113–118, ago. 2020.

MUSCOGIURI, G. et al. Prader- Willi syndrome: An uptodate on endocrine and metabolic complications. Reviews in Endocrine and Metabolic Disorders, v. 20, n. 2, p. 239–250, 7 maio 2019.

MUSCOGIURI, G. et al. Obesity in Prader–Willi syndrome: physiopathological mechanisms, nutritional and pharmacological approaches. Journal of Endocrinological Investigation, v. 44, n. 10, p. 2057–2070, 2021.

NOLAN, B. J.; PROIETTO, J.; SUMITHRAN, P. Intensive management of obesity in people with Prader-Willi syndrome. Endocrine, v. 77, n. 1, p. 57–62, 7 maio 2022.

PINHEIRO, M. L. A. *et al*. A evolução dos métodos de ensino da anatomia humana –uma revisão sistemática integrativa da literatura. Revista Bionorte, Montes Claros, v. 10, n. 2, p. 168-181, jul./dez. 2021. Disponível em: https://doi.org/10.47822/bionorte.v10i2.279.

RUBIN, D. A. et al. Changes in cardiometabolic markers in children with Prader-Willi syndrome and nonsyndromic obesity following participation in a home-based physical activity intervention. Pediatric Obesity, v. 13, n. 11, p. 734–743, 17 set. 2018.

TAN, Q. et al. Current and emerging therapies for managing hyperphagia and obesity in Prader-Willi syndrome: A narrative review. Obesity Reviews, v. 21, n. 5, maio 2020.

WOLFE, G. et al. Metabolic and bariatric surgery for obesity in Prader Willi syndrome: systematic review and meta-analysis. Surgery for Obesity and Related Diseases, v. 19, n. 8, p. 907–915, 1 ago. 2023.

ZUBRZYCKI, A. et al. The role of low-calorie diets and intermittent fasting in the treatment of obesity and type-2 diabetes. Journal of Physiology and Pharmacology: An Official Journal of the Polish Physiological Society, v. 69, n. 5, 1 out. 2018.

Hepatic encephalopathy approach: Pharmacological therapy

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ABSTRACT
Introduction: Hepatic encephalopathy is a neuropsychiatric complication that occurs in patients with advanced liver disease, resulting in a variety of neurological and psychiatric symptoms. Effective treatment is of paramount importance due to the morbidity associated with this condition. Objective: This study aims to review current therapeutic approaches for hepatic encephalopathy, highlighting common treatment strategies and future prospects for therapeutic intervention. Methodology: The review was conducted by searching scientific databases, including relevant clinical trials, to identify therapeutic strategies used in hepatic encephalopathy. Results: Common therapeutic approaches for hepatic encephalopathy include dietary protein restriction, the use of Lactulose for ammonia excretion, and the administration of antibiotics such as rifaximin to reduce ammonia-producing intestinal flora. Various research efforts are underway to discover future pharmacological therapies. Conclusion: The therapeutic approach to hepatic encephalopathy is multifaceted, aiming to alleviate acute symptoms and prevent recurrences. A multidisciplinary strategy is essential for the effective management of this complex condition, and ongoing research is exploring new therapies that may improve the prognosis and quality of life for affected patients. Understanding the pathophysiology of hepatic encephalopathy is evolving, offering hope for more effective treatments in the future.

Keywords: Hepatic encephalopaty, Drug therapy, Therapy.

1 INTRODUCTION

Hepatic Encephalopathy (HE) is a potentially reversible neuropsychiatric syndrome of metabolic origin, secondary to the accumulation of neurotoxic substances in brain tissue resulting from the complication of cirrhosis and acute liver diseases. Chronic liver failure is the main etiology of HS and is among the leading causes of death in Latin America. It has a slow course of evolution, usually around months, but may present periods of exacerbation. The clinical manifestations of the disease are heterogeneous, characterized mainly by changes in personality, consciousness, cognition and motor function. This disease compromises the patient's quality of life and significant expenses for health providers. (DANI, 2011; CIOGLIA; LIMA, 2019)

The normal liver is responsible for metabolizing and clarifying protein substances with neurotoxic potential, originating in the intestine. Under physiological conditions, toxins are absorbed by enterocytes, cells that line the intestinal mucosa, pass through the mesenteric circulation, reach the portal vein, and then penetrate the hepatic space to be metabolized. However, in patients with hepatocellular dysfunction and/or portal hypertension, due to failure to metabolize and/or divert blood from the mesenteric circulation to the systemic circulation, toxins reach brain tissue. (DANI, 2011; SAINTS; COSAC, 2020)

There are several ways to classify hepatic encephalopathy. According to the guidelines of the American Association for the Study of Liver Diseases (AASLD), according to the underlying cause, HS can be divided into three types: type A related to acute liver failure, type B as a consequence of the presence of portosystemic shunts in the absence of liver dysfunction, and type C related to the presence of portosystemic shunts with the presence of liver cirrhosis. Current discussions consider a fourth type (type D), defined as "acute-on-chronic liver failure" and characterized by acute deterioration of liver function in patients with chronic liver disease. (WEISSENBORN, 2019)

Regarding the clinical manifestations and the degree of impairment of the patient's autonomy, the disease can be divided into minimal or subclinical, mild (grade I) and severe (grade II, III, IV). As for the triggering factors, they can be divided into precipitate, when a causative factor is recognized, or non-precipitate, when this factor is not found. Finally, there is a temporal division classified as episodic, recurrent (when there are at least 2 episodes of HS in a period of 6 months) and persistent (presence of behavioral changes that are always present and negatively impact the patient's social life and behavior). Studies show that about 80% of patients with chronic liver failure will develop minimal HS, which is considered an important predictive factor for the development of HS in the future. (CIOGLIA; LIMA, 2019; FERENCI, 2002)

Although it is a complex syndrome, there are still no studies that address the pathophysiological mechanisms in depth, which means that they have not been well elucidated. Among the existing suggestions are: neurotransmitter dysfunction, oxidative and nitrosative stress, hyperammonemia, and neuroinflammation. Currently, the neurotoxin that causes the disease is ammonia. (FRAZÃO et al., 2023; STRAUSS; REIS, 2011)

The symptoms observed are very broad, so the following can be mentioned in the semiological findings: mental confusion, personality changes, disorientation and impaired level of consciousness. The first symptoms to appear are usually sleep disturbances, such as changes in the sleep-wake cycle. Personality changes may be more frequent than when compared to psychiatric illnesses. The presence of asterixis (or "flapping tremor") can be detected, however, it is not pathognomonic of the disease. When HS results from liver cirrhosis, hepatic breath may also be present. In advanced stages, patients

may progress to coma and, ultimately, death if they are not transplanted. (FRAZÃO et al., 2023; CIOGLIA; LIMA, 2019)

The diagnosis is eminently clinical and is based on a good anamnesis, consisting of the patient's history, physical examination, and evaluation of liver function. The existing complementary tests have some limitations, the serum ammonia dosage will be increased, but it has low specificity and the levels found cannot be related to the degree of encephalopathy. In addition, the electroencephalogram may demonstrate alterations, however, none of them are considered pathognomonic of HS, and they have no prognostic value. To assess severity, specific neurological scales and tests can be used, such as the Glasgow Coma Scale and the West Havens Scale for hepatic encephalopathy. Decompensating factors such as upper gastrointestinal bleeding, constipation, and infections should also be evaluated at the time of diagnosis. (SAINTS; COSAC, 2020)

The treatment is based on reducing the production of ammonia by the body, by controlling the proliferation of bacteria in the intestine and increasing the absorption of ammonia by the body. First-line therapy is based on Lactulose (beta-galactosidofructose), a compound that is metabolized by intestinal bacteria and transformed into organic acids capable of lowering enteric pH and preventing the production of ammonia-producing bacteria. (FALLAHZADEH; RAHIMI, 2022)

In patients with recurrent encephalopathy, therapy has been based on the use of non-absorbable antibiotics that act on intestinal bacteria, resulting in a decrease in ammonia production. Studies have shown that Rifaximin, the only antibiotic approved for use in HS, is able to act in the patient's recovery and in the prevention of new conditions, so it can be used as an acute phase and maintenance treatment. (FALLAHZADEH; RAHIMI, 2022)

Other treatment options have been discussed, such as: L-ornithine-L-aspartate, capable of increasing the metabolism of ammonia into glutamine, but whose use is limited in case of severe renal failure. L-acetyl-carnitine has been pointed out as an option, since it acts by increasing the production of acetylcholine in the brain and improving the synthesis of proteins and phospholipids capable of alleviating neuronal toxicity in hepatic encephalopathy. In addition, the use of probiotics, sodium benzoate and oral zinc supplementation have been mentioned as therapeutic options. It is also worth emphasizing the importance of managing precipitating factors in the treatment of the condition and in the prevention of recurrences. (LANNA et al., 2011; FALLAHZADEH; RAHIMI, 2022)

2 OBJECTIVE

This study aims to address treatment options for Hepatic Encephalopathy, since it is a condition for which there are few approved therapies and several therapeutic options that are still in the process of development, thus requiring more studies to be done.

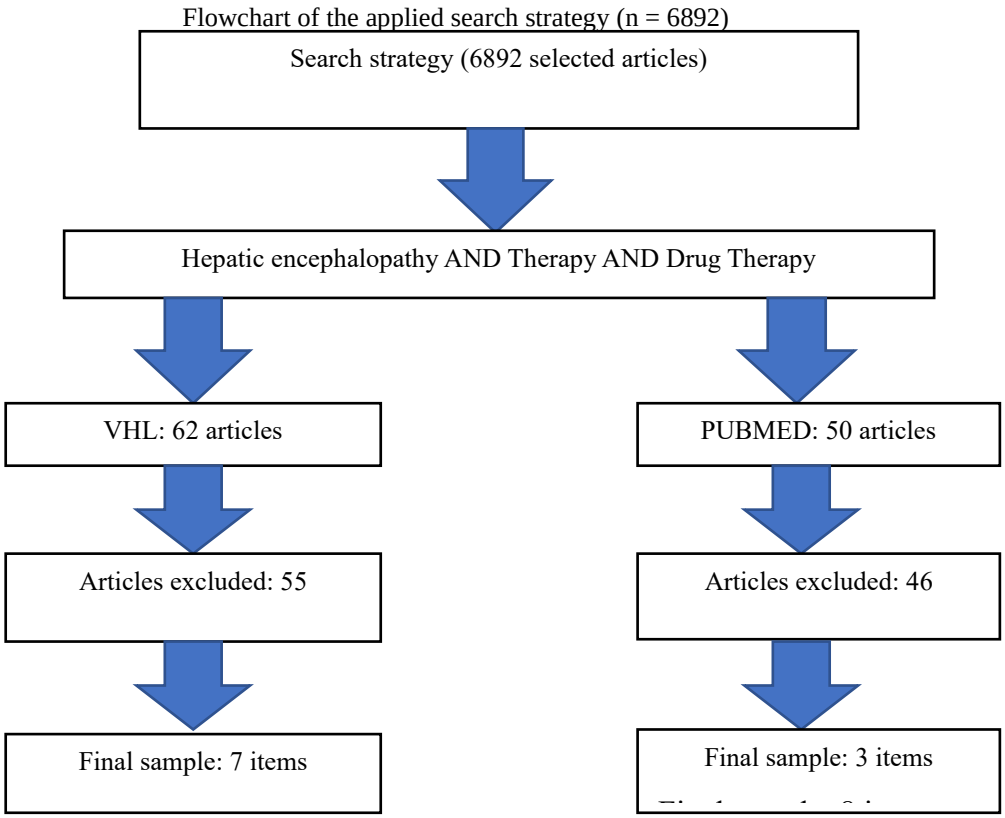
3 MATERIALS AND METHODS

The present study is an integrative literature review that enables the search, critical evaluation and synthesis of available evidence on the investigated topic. In the first stage, the following guiding question was asked: "What are the treatment options for Hepatic Encephalopathy?".

Then, in the second stage, in October 2023, the scientific search was carried out through the PubMed and VHL platforms, using the following descriptors indexed in the Health Sciences Descriptors (DeCS): 'hepatic encephalopathy", 'therapy' and "*drug therapy*", which were gathered using the Boolean descriptor AND.

Regarding the inclusion criteria for the selection of articles, the following were established: articles published in the last five years, available as full text and in English, Portuguese or Spanish.

Initially, 6892 studies were found based on the use of the descriptors in the databases, 35 in PubMed, 6702 in Medline, 21 in the Latin American and Caribbean Health Sciences Literature (LILACS), 14 in the Index Medicus for the Western Pacific (WPRIM), 6 in the Spanish Bibliographic Index in Health Sciences (IBECS), 1 in the National Bibliography in Health Sciences (BINACIS) and 1 in the Regional Base of Reports on the Evaluation of Technologies in Salud de las Américas (BRISA/RedTESA). After applying the inclusion and exclusion criteria, 112 studies were selected; these were screened considering the reading of the title and keywords, and 23 studies were considered in the next stage of selection. Then, 4 were excluded due to duplication, leaving 19 papers to be read and, of these, 15 underwent a full analysis and 10 investigations made up the final sample.



Finally, a data collection form was used for the critical analysis of the studies, consisting of the following information: title, authors, year, place of execution of the study, sample, objective, design, and main results (Pinheiro *et al.*, 2021). The selection of articles was carried out independently by three authors and there was no disagreement regarding the selected works.

4 RESULTS

The studies analyzed were published between 2018 and 2023 and conducted in the United States, England, India, Israel, Australia, Switzerland, Denmark, Ukraine, Russia, Poland, Hungary, Egypt, and China. Regarding the methodological approach, the studies were non-randomized clinical trials (n=1, 10%) and randomized clinical trials (n=9, 90%). Adults with a diagnosis of liver cirrhosis established by criteria such as Child-Phug, whether or not they had a history of hepatic encephalopathy participated in the studies (Chart 1).

Table 1 – Characteristics of the selected studies. (n=10).

Author and year	Outline	Objective	Sample & Scenario	Main results
PATEL et al., 2021	Randomized, double-blind, placebo-controlled clinical trial.	To examine the mechanism of action of Rifaximin, considered an effective treatment for Hepatic Encephalopathy	This was a randomized clinical trial with a duration of 17 months, with a double-blind placebo-controlled period of 90 days. The sample consisted of 50 patients with liver cirrhosis and chronic hepatic encephalopathy. Rifaximin was administered 550mg twice a day in one group and placebo in another group.	Rifaximin led to resolution of covert and apparent hepatic encephalopathy, reduced the likelihood of infection, reduced bowel oralization, and attenuated systemic inflammation.
FAGN et al., 2023	Randomized, double-blind, placebo-controlled clinical trial	To determine the impact of albumin vs. saline on minimal hepatic encephalopathy and quality of life in individuals with a history of hepatic encephalopathy who are already on treatment.	Randomized clinical trial with a 5-week double-blind period. The sample consisted of patients with cirrhosis and a history of hepatic encephalopathy, who had minimal hepatic encephalopathy and hypoalbuminemia already being treated for HS. Patients who were already receiving regular infusions of IV albumin were excluded.	Albumin infusions have been associated with improved cognitive function and quality of life, probably due to improved endothelial dysfunction.

			A weekly infusion of 25% IV albumin at a dose of 1.5g/kg was administered in one group and placebo and saline solution in another group.	
BAJAJ et al., 2019	Randomized, placebo-controlled clinical trial.	To determine the safety, tolerability, and microbiota impact of mucosa and/or feces after fecal microbiota transplantation by oral capsules and their influence on brain function in hepatic encephalopathy.	Randomized placebo-controlled clinical trial lasting 5 weeks. The sample consisted of 20 patients with liver cirrhosis and recurrent hepatic encephalopathy using lactulose and rifaximin. A total of 15 fecal microbiota transplant capsules composed of feces from the same donor and placebo were administered to another group.	Administration of fecal microbiota transplantation orally was associated with a favorable change in mucosal and faecal microbial composition and an increase in the intestinal barrier.
AHMED et al., 2020	Randomized clinical trial	To compare the difference in efficacy and outcome of PEG+Lactulose administration versus Lactulose alone in acute-on-chronic-liver failure.	Randomized clinical trial. The sample consisted of 60 patients with acute-on-chronic liver failure with EH≥ grade 2 according to the West Haven criteria. Patients using Rifaximin were excluded. It was administered PEG3350+Lactulose in a group of 29 patients and Lactulose alone in another group of 31 patients.	PEG resulted in early and sustained resolution of hepatic encephalopathy with improved short-term survival. It has been shown to be a safe drug in patients with acute HS in the ACLF.
RAHIMI et al., 2021	Randomized, double-blind, placebo-controlled clinical trial.	To evaluate the efficacy and safety of Ornithine Phenylacetate (OP) in hospitalized patients with cirrhosis, increased ammonia levels at screening, and acute or overt hepatic encephalopathy.	This is a randomized phase I clinical trial with a duration of 35 months, with a double-blind placebo-controlled period of 5 days. Sample consisted of 231 hospitalized patients with liver cirrhosis, hyperammonemia, and stage 2 or higher hepatic encephalopathy in the Hepatic Encephalopathy Stage Tool (HEST).	The median time to clinical improvement based on ammonia measurements in local laboratories showed no significant difference between the groups. Analyses performed in a central laboratory based on ammonia levels demonstrated clinical improvement with an average of approximately 21 hours earlier in the OP group.

			Continuous intravenous infusion of OP was administered for 5 days or less at a dose of 500ml/24h (20.8ml/h) + institution-standard drug in one group and placebo + institution-standard drug in another group.	
SAFADI et al., 2022	Randomized, double-blind, placebo-controlled clinical trial.	To analyze the pharmacokinetic and pharmacodynamic effects of Ornithine Phenylacetate (OP) in patients with hepatic encephalopathy and to evaluate the clinical effect of plasma reduction of ammonia concentration at the HS stage.	This is a randomized phase II clinical trial with a duration of 35 months, with a double-blind placebo-controlled period of 5 days. Sample consisted of 231 patients hospitalized with liver cirrhosis, hyperammonemia, and hepatic encephalopathy stage 2 or higher on the Hepatic Encephalopathy Stage Tool (HEST) despite standard of care care treatment for 48 hours. Continuous intravenous infusion of OP was administered for 5 days or less at a dose of 500ml/24h (20.8ml/h) + institution-standard drug in one group and placebo + institution-standard drug in another group.	The results of the pharmacokinetic/pharmacodynamic analysis are consistent with the purported mechanism of action of Ornithine Phenylacetate. Plasma OP levels reach steady state in approximately 48-72 hours, regardless of dose, and appear to increase as hepatic function declines. Treatment with OP significantly improves plasma ammonia and the clinical stage of hepatic encephalopathy.
MONTAGNESE et al., 2021	Randomized, double-blind, placebo-controlled clinical trial.	To analyze data on the safety, pharmacokinetics (PK), and efficacy of golexanolone in adult patients with cirrhosis of the liver.	Randomized clinical trial with a 3-week double-blind placebo-controlled period. Sample consisted of 45 patients with Child-Pug A/B liver cirrhosis and abnormal continuous reaction time (CRT) at screening. Golaxenolone (10, 40 or 80 mg) was	Golexanolonone exhibited satisfactory safety and PK, being well tolerated and associated with improved cognitive performance. These results imply the relationship of GABA-A receptor modulating neurosteroids in the pathogenesis of hepatic encephalopathy, supporting the therapeutic potential of Golexanolon.

			administered twice daily in one group and placebo in the other group.	
VIDOT et al., 2019	Randomized, double-blind, placebo-controlled clinical trial	To investigate the effect of oral supplementation with synbiotics and/or BCAAs on hepatic encephalopathy in patients who were receiving continuous treatment with Lactulose.	Randomized clinical trial with a double-blind placebo-controlled period of 8 weeks. Sample consisted of 49 patients with liver cirrhosis and a history of hepatic encephalopathy, who were on daily lactulosis, abstinence from alcohol and intravenous drugs for at least 3 months prior to study entry. The study was divided into 4 groups. Synbiotic placebo and BCAA placebo were administered in group 1, synbiotic + BCAA placebo in group 2, BCAA + synbiotic placebo in group 3, and synbiotic + BCAA in group 4.	Results suggest that oral supplementation with a combination of synbiotics and BCAAs in hepatic encephalopathy may be an effective additional treatment, however, there was a cognitive improvement with no change in ammonia levels.
SHEHATA et al., 2018	Randomized clinical trial	To evaluate the safety and efficacy of Polyethylene Glycol (PEG) versus Lactulose in the management of hepatic encephalopathy.	Randomized clinical trial lasting 7 months. Sample consisted of 100 patients with liver cirrhosis after hepatitis C who were admitted with hepatic encephalopathy. Lactulose was administered to a group of 50 people and PEG to another group of 50 people.	Both Lactulose and PEG have been safe in the treatment of hepatic encephalopathy (HE). PEG significantly reduced the time required for HS treatment, reducing the length of hospital stay.

YU et al., 2022	Clinical Trial	To evaluate the impact of Rifaximin administration on the gut microbiota and bacterial resistance profile in cirrhotic patients.	Clinical trial. A sample of 21 patients with cirrhosis who were in remission of recurrent hepatic encephalopathy received rifaximin 400mg three times a day for 12 weeks.	Rifaximin improved hyperammonemia and cognitive function in the 21 patients. The observations showed that the diversity of the gut microbiota, the composition and number of resistance genes, plasmids and insertion sequences did not change significantly.

5 DISCUSSION

Advanced cirrhosis brings with it a number of complications, including hepatic encephalopathy (HE), variceal bleeding, ascites, and a propensity to develop infections. In addition to the above, cirrhosis causes an alteration in the intestinal microbiota, favoring the proliferation of ammonia-producing inflammatory bacteria species, and an increase in intestinal biomarkers of systemic inflammation, such as TNF-α and TLR-4. Although there are other factors related to the development of HS, hyperammonemia is the main cause associated with the occurrence of hepatic encephalopathy and its control is directly related to the main medical therapies approved by medical institutions, such as the American Association for the Study of Liver Diseases and the European Association for the Study of the Liver.

Among the existing and currently recommended treatments is the antimicrobial Rifaximin-α. In a randomized placebo-controlled study to analyze the mechanism of action of rifaximin in improving HS, it was shown that the drug was associated with a reduction in the levels of gut-derived biomarkers of systemic inflammation. The antimicrobial suppressed the growth of opportunistic oral pathogens and led to an increase in oral health-associated levels of Lactobacillus and Streptococcus spp. In addition, rifaximin was able to prevent cases of HS by improving the function of the intestinal barrier, by promoting the proliferation of epithelial cells and the production of mucus. Plasma lactate levels were also reduced by the drug. Considering that more than 75,000 microbial genes differ between patients with cirrhosis and healthy individuals, and that more than 50% of bacteria originate from saliva, it is clear that the drug mentioned is effective in hepatic encephalopathy and is related to an improvement in the patient's neurocognitive function. (PATEL et al., 2021)

Constant use of antimicrobials can lead to the development of bacterial resistance. Following this bias, a study by YU et al., 2022 sought to analyze the impact of Rifaximin on the gut microbiota and resistance profile in cirrhotic patients. The results found corroborated the findings of the study by PATEL et al., 2021, demonstrating that the drug had little effect on the diversity of the gut microbiota, increased the production of F. prusnitzii, a strain that produces anti-inflammatory effects that significantly improve intestinal inflammation and control obesity, as well as reducing bacteria associated with damage to the intestinal barrier and maintaining the abundance of beneficial bacteria.

Regarding the development of resistance, the research did not observe a significant increase in intestinal resistance genes in patients, and there was no significant increase in plasmids and insertion sequences related to the transport and transmission of resistance-related genes, showing safety in the constant use of Rifaximin. However, it is worth noting that the research time was only 12 weeks, raising questions about resistance over longer periods. In addition, the sample size was small (n=21) and did not take into account intrinsic factors of each patient, such as diet, lifestyle, use of other medications, life history and genetics.

Among the consequences of hepatic encephalopathy is a cognitive impairment that affects the patient's quality of life and socioeconomic condition. Evidence shows that this state of persistent cognitive impairment is accompanied not only by systemic inflammation and high ammonia levels, but also by a reduction in albumin levels and its ability to bind to metabolites that precipitate HS in patients with advanced cirrhosis. In the study conducted by FAGN et al., 2023, this hypothesis was proven and it was shown that intravenous albumin is associated with improvement in cognitive dysfunction in individuals with cirrhosis, improving levels of inflammatory markers and endothelial dysfunction when compared to the placebo group. However, it is noteworthy that there was no change in liver disease severity or venous ammonia levels between groups. Such a study demonstrates that albumin therapy improves cognitive performance that persists for up to one week after albumin discontinuation. However, larger studies are needed to validate these findings, since only 2 other studies on the use of albumin have been conducted, but none of them evaluated the results on the cognitive impairment of patients. (FAGN et al., 2023)

Following the line of reasoning that relates HS to an intestinal dysbiosis, the study by BAJAJ et al., 2019 evaluates the safety of fecal microbiota transplantation (FMT) through oral capsules. FMT has been shown to be safe, well-tolerated, and associated with a favorable change in serum lipopolysaccharide-binding protein (LBP) levels, as well as improving duodenal mucosal barriers and mucosa. However, this study maintained the administration of Rifaximin in patients, raising questions about the results found, since the antimicrobial has similar results already proven. In this sense, further studies are needed to prove the efficacy and corroborate the results found.

Also considering the intestinal dysbiosis identified in patients with cirrhosis, the study conducted by VIDOT et al., 2019 sought to investigate the effects of the administration of synbiotics and/or BCAAs in the treatment of HS. It was considered that the proposed supplementation would promote an increase in the growth and diversity of beneficial bacteria, resulting in improved brain and cognitive function. The results showed no adverse effects of the use of synbiotics and BCAAs, alone or in combination, and demonstrated positive results in the treatment of synbiotics together with BCAAs, suggesting that the combined use of the two compounds could be an effective additional

treatment in individuals with HS, thus demonstrating the need and importance of further research in this regard.

Current protocols for the treatment of HS in acute-on-chronic liver failure consist of addressing precipitating factors, correcting electrolytes, treating sepsis and gut dysbiosis, and ammonia-focused therapy such as the use of lactulose and antibiotics. Considering that early bowel evacuation and excretion of ammonia through feces are crucial for the treatment of HS, the possibility of PEG being a better alternative to Lactulose has been discussed. An early bowel purge using PEG3350 has been shown to achieve earlier, longer-lasting, and safer resolution when compared to Lactulose alone. These results demonstrate advantages such as reduced hospital stay and faster recovery with PEG. Despite the reported clinical improvement, ammonia levels did not show significant changes, suggesting that PEG acted in ways other than ammonia reduction. Even if the study demonstrated improved survival and early resolution, the results may be questioned because they were not placebo-controlled and because there was no blinding in the study. In addition, the use of PEG occurred alongside the use of Lactulose, thus raising doubts about the true benefits of PEG. (AHMED et al., 2020)

Another clinical trial that followed this same line of reasoning sought to evaluate the safety and efficacy of polyethylene glycol versus Lactulose, thus investigating the gap observed in the study by AHMED et al., 2020. The results of this study showed that patients with cirrhosis who received PEG as initial therapy for hepatic encephalopathy showed faster clinical improvement than patients who received Lactulose, favoring the individuals to return to normal life more quickly. PEG was better tolerated and had no serious adverse effects. The study conducted by Shehata et al., 2018 corroborated the results found by AHMED et al., 2020 that PEG would be a good alternative to Lactulose and addressed the questions left by such an assay. Therefore, further research addressing this hypothesis would be beneficial and could cause changes in the currently approved HS treatment.

Although studies have demonstrated a complex and multifactorial etiology for HS, the increase in ammonia levels is considered the key to the pathophysiology of the disease. Ornithine phenylacetate is an ammonia collector capable of reducing ammonia levels independently of intestinal action in patients with cirrhosis. Considering this information, a study conducted by RAHIMI et al., 2021 sought to analyze the efficacy of the drug in the treatment of hepatic encephalopathy. The results showed that there was no difference in the mean time of improvement between the group that received the drug and the placebo group. It was also demonstrated that the safety profile of the drug supports further studies to be carried out in the future in order to corroborate the results found. Another study conducted by SAFADI et al., 2022 sought to characterize the pharmacokinetics and pharmacodynamics of Ornithine Phenylacetate (OP), considering the plasma level of ammonia as the primary pharmacodynamic variable. OP was significantly superior to placebo in terms of reducing plasma ammonia levels and the time required for these levels to normalize, and is directly related to the dose

used (dose-dependent). The studies also demonstrated the correlation between ammonia values and clinical response, in line with the results found in the study conducted by RAHIMI et al., 2021. In this sense, it is possible to question the results found in the study conducted by SAFADI et al., 2022, since, in addition to presenting discrepant results from the other, a reduction in ammonia levels was also observed in the placebo group. Considering that both the placebo group and the test group received standard therapy during their hospital stay, and that the placebo group also showed improvement, questions arise about the extent to which ornithine phenylacetate was actually beneficial. In addition, in the study by SAFADI et al., 2022, the OP dose was not randomized, but calculated based on individual parameters of each patient. Thus, we conclude the need for larger trials to evaluate OP in the treatment of hepatic encephalopathy, since the two studies used in this study reached different conclusions regarding the clinical progression of the disease.

In the various forms of division proposed for hepatic encephalopathy, the disease can be divided into minimal/subclinical, mild or severe according to the clinical manifestations presented. The therapeutic basis currently approved is focused on manifested HS, so there is no treatment directly indicated for the subclinical type. A study conducted by Montagnese et al., 2021 considered that the cognitive problems presented at this stage of the disease could be improved by a drug designed to normalize the function of receptors that inhibit brain function, Golexanolon. This hypothesis can be corroborated by other recent studies that suggest that the cerebral effects of hyperammonemia and other injuries such as neuroinflammation are mediated by neurosteroid-induced allosteric activation of GABA-A inhibitory receptors. The GABA system, the brain's main inhibitory neutrotransmitter system, regulates functions such as learning, memory, wakefulness and sleep. In addition to GABA, endogenous neurosteroids such as alognanolone are strong positive allosteric modulators mediated by the activation of GABA-A receptors and are present in increased amounts in the brains of HS patients. Following this line of reasoning, the study demonstrated benefits of Golexanolonone in the cognitive performance of patients with HS, being generally well tolerated, supporting the hypothesis of the role of neurosteroids in the pathogenesis of disease-related sleepiness. It is necessary that larger studies be carried out to prove these findings.

6 CONCLUSION

Hepatic encephalopathy is one of the most serious complications of liver cirrhosis, presenting as a debilitating condition that affects the patient's quality of life and brings high health costs. Rapid recognition and correct management of hepatic encephalopathy are directly related to the clinical improvement of the individual.

Treatment is based on the elimination of triggers and toxic substances from the intestine. The currently approved therapeutic measures are Lactulose and the use of antibiotics such as Rifaximin

and Metronidazole. It is also necessary to provide energy and protein, in addition to being careful with glycemic values and hydroelectrolyte disorders.

As demonstrated throughout this study, several interventions have been suggested and studied for the prevention and treatment of hepatic encephalopathy, such as the use of albumin, fecal transplantation by oral capsules, polyethylene glycol, Ornithine Phenylacetate, synbiotics, BCAAs and Golexanolon. However, more research and studies are needed.

Considering the great impact caused by HS and the high risk of death associated with this disease, further studies in this regard are important to increase therapeutic accuracy and ensure excellent treatment and better quality of life for affected individuals.

REFERENCES

AHMED, S. et al. Combined PEG3350 Plus Lactulose Results in Early Resolution of Hepatic Encephalopathy and Improved 28-Day Survival in Acute-on-Chronic Liver Failure. Journal of Clinical Gastroenterology, v. 56, n. 1, p. e11–e19, 13 out. 2020.

BAJAJ, J. S. et al. Fecal Microbial Transplant Capsules Are Safe in Hepatic Encephalopathy: A Phase 1, Randomized, Placebo-Controlled Trial. Hepatology, v. 70, n. 5, p. 1690–1703, 18 jun. 2019.

CIOGLIA, L.; LIMA, D. UNIVERSIDADE FEDERAL DE MINAS GERAIS Programa de Pós-Graduação em Patologia Faculdade de Medicina PATOLÓGICAS, INFLAMATÓRIAS E NEUROQUÍMICAS NA ENCEFALOPATIA HEPÁTICA EXPERIMENTAL. [s.l: s.n.]. Disponível em:<https://repositorio.ufmg.br/bitstream/1843/42272/3/Disserta%C3%A7%C3%A3o%20FINAL%20Luiza%20Cioglia.pdf>.

DANI, R. Gastroenterologia Essencial. [s.l.] Guanabara Koogan, 2011. v. 4

FAGAN, A. et al. A double-blind randomized placebo-controlled trial of albumin in outpatients with hepatic encephalopathy: HEAL study. Journal of Hepatology, v. 78, n. 2, p. 312–321, 1 fev. 2023.

FALLAHZADEH, M. A.; RAHIMI, R. S. Hepatic Encephalopathy: Current and Emerging Treatment Modalities. Clinical Gastroenterology and Hepatology, v. 20, n. 8, p. S9–S19, ago. 2022.

FERENCI, P. Hepatic encephalopathy—Definition, nomenclature, diagnosis, and quantification: Final report of the Working Party at the 11th World Congresses of Gastroenterology, Vienna, 1998. Hepatology, v. 35, n. 3, p. 716–721, mar. 2002.

FRAZÃO, L. F. N. et al. Encefalopatia hepática: uma revisão narrativa. Research, Society and Development, v. 12, n. 3, p. e10712340587, 27 fev. 2023.

HANY, H. et al. Sa1441 - Randomized Controlled Trial of Polyethylene Glycol Versus Lactulose for the Treatment of Overt Hepatic Encephalopathy. Gastroenterology, v. 154, n. 6, p. S-1114, maio 2018.
LANNA, A. et al. Abordagem terapêutica na encefalopatia hepática. Rev Med Minas Gerais, v. 21, 2011.

MONTAGNESE, S. et al. A pilot study of golexanolone, a new GABA-A receptor-modulating steroid antagonist, in patients with covert hepatic encephalopathy. Journal of Hepatology, v. 75, n. 1, p. 98–107, 24 mar. 2021.

PATEL, V. C. et al. Rifaximin reduces gut-derived inflammation and mucin degradation in cirrhosis and encephalopathy: RIFSYS randomised controlled trial. Journal of Hepatology, v. 76, set. 2021.

PINHEIRO, M. L. A. *et al*. A evolução dos métodos de ensino da anatomia humana –uma revisão sistemática integrativa da literatura. Revista Bionorte, Montes Claros, v. 10, n. 2, p. 168-181, jul./dez. 2021. Disponível em: https://doi.org/10.47822/bionorte.v10i2.279.

RAHIMI, R. S. et al. Efficacy and Safety of Ornithine Phenylacetate for Treating Overt Hepatic Encephalopathy in a Randomized Trial. Clinical Gastroenterology and Hepatology, v. 19, n. 12, p. 2626-2635.e7, 1 dez. 2021.

SAFADI, R. et al. Pharmacokinetics/pharmacodynamics of L-ornithine phenylacetate in overt hepatic encephalopathy and the effect of plasma ammonia concentration reduction on clinical outcomes. Clinical and Translational Science, v. 15, n. 6, p. 1449–1459, 3 mar. 2022.

SANTOS, C. N.; COSAC, L. M. D. P. ENCEFALOPATIA HEPÁTICA ETIOLOGIA, SINTOMATOLOGIA, FISIOPATOLOGIA E MANEJO CLÍNICO / HEPATIC ENCEPHALOPATHY ETIOLOGY, SYMPTOMATOLOGY, PATHOPHYSIOLOGY AND CLINICAL MANAGEMENT. Brazilian Journal of Development, v. 6, n. 10, p. 76197–76208, 2020.

STRAUSS, E.; REIS, M. FISIOPATOLOGIA DA ENCEFALOPATIA HEPÁTICA (EH). [s.l: s.n.]. Disponível em: <https://sbhepatologia.org.br/pdf/encefalopatia/d5.pdf>.

VIDOT, H. et al. Supplementation with Synbiotics and/or Branched Chain Amino Acids in Hepatic Encephalopathy: A Pilot Randomised Placebo-Controlled Clinical Study. Nutrients, v. 11, n. 8, p. 1810, 6 ago. 2019.

WEISSENBORN, K. Hepatic Encephalopathy: Definition, Clinical Grading and Diagnostic Principles. Drugs, v. 79, n. S1, p. 5–9, 31 jan. 2019.

YU, X. et al. Rifaximin Modulates the Gut Microbiota to Prevent Hepatic Encephalopathy in Liver Cirrhosis Without Impacting the Resistome. Frontiers in Cellular and Infection Microbiology, v. 11, 18 jan. 2022.

Health promotion in elderly patients with hyponatremia related to polypharmacy: The nurse's role

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ABSTRACT
Hyponatremia is a condition with a low concentration of sodium in the body that presents itself occasionally in long-lived patients, with greater aggravations in a scenario of polymedications. Objective: To analyze articles that address the theme: The importance of nurses' performance in health promotion in elderly people with hyponatremia. Method: This paper is a systematic literature review of integrative evaluation. The results find the necessary correlation between professional development, characteristics of the elderly person with hyponatremia and its implications regarding polymedication. Nurses are the main agents in health promotion, they know all the particularities of their patients, plan, implement and participate in the entire process. This work was developed with the purpose of sensitizing and providing learning to professionals, so that they are more engaged and participate in a more assertive way in the promotion of the health of the population in which they work.

Keywords: Hyponatremia, Sodium, Elderly, Nurse, Health, Polymedication.

1 INTRODUCTION

FACTORS THAT INCREASE THE VULNERABILITY OF THE ELDERLY TO DRUGS	
Pharmacokinetic	- Decreased organ function, especially in drugs eliminated renally or with the first hepatic pass. - Decrease in muscle mass and increase in fat mass, which conditions changes in distribution and accumulation
Pharmacodynamic	- Increased sensitivity to medications, especially anticholinergics and those affecting cognitive function. - Alteration of homeostatic mechanisms.
Functional Capacity	- Visual deficits that lead to difficulty reading instructions or labels on medications. - Hearing deficits that can contribute to problems understanding verbal instructions or explanations.
Cognitive Ability	- Difficulty remembering new instructions. - Poor adhesion conditioned by problems with memory or comprehension.

Financial Factors		- Cost of medications can interfere with adherence.	
Need	Nursing Diagnosis	Results	Interventions
Learn	Ineffective self-management of health, related to polypharmacy, characterized by inadequate knowledge about the treatment regimen	Effective control of the drug regimen	Conduct health education on the correct use of medications; guide dose, time, duration of treatment; schematize and organize schedules in a clear way for the elderly; to adapt the therapeutic regimen to the routine of the elderly; guide the proper storage of medications; Assess and monitor treatment adherence; schedule medications by paying attention to drug interactions; assess adverse effects; To assess cognition, visual acuity of the elderly and self-care capacity; Assess self-medication; refer to a geriatrician to reduce the prescription in order to avoid therapeutic duplication; Instruct family members and caregivers about the medication regimen.
Eating and drinking properly	Risk of dysfunctional gastrointestinal motility, related to age and treatment regimen	Functional gastrointestinal motility	Orient times away or close to meals according to the characteristics of the medication; stimulate adequate water intake;
Eliminate organic waste	Risk of electrolyte imbalance, related to treatment regimen and renal dysfunction	Electrolyte balance	Order tests to assess kidney function; identify medications that can alter electrolyte status, such as diuretics, antihypertensives, and calcium channel blockers; evaluate and guide diet and appropriate water intake; Assess signs and symptoms of kidney disease

SEVEN publicações acadêmicas

Scientific advances in the concept of the relationship between irritable bowel syndrome (IBS) and food intolerance

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ABSTRACT

Irritable bowel syndrome (IBS) continues to be a clinical challenge in the 21st century. It is the most commonly diagnosed gastrointestinal condition and also the most common reason for referral to gastroenterology clinics. 1It can affect up to one in five people at some point in their lives and has a significant impact on quality of life and healthcare utilisation. The diagnosis of IBS is not confirmed by a specific test or structural abnormality. Today, the Rome III Criteria are the gold standard for diagnosing IBS. Several mechanisms and theories have been proposed about its etiology, but the biopsychosocial model is currently the most accepted for IBS. However, about two-thirds of patients with IBS have clinical symptoms induced by food intolerance, including gastrointestinal symptoms such as abdominal pain, bloating, diarrhea, or constipation. Common types of food intolerance include lactose intolerance, gluten intolerance, FODMAP intolerance, and histamine intolerance, among which lactose intolerance and FODMAP intolerance are more common in IBS patients. The exact mechanism by which food intolerance is involved in IBS is not fully understood. The symptom complex would be the result of the interaction between psychological, behavioral, psychosocial and environmental factors. Recently, some studies have shown the possible role of histamine and its relationship with non-allergic intolerance as a mediator of digestive clinical manifestations in patients with IBS.3,4 In this chapter we will discuss the role of food intolerance in IBS through a summary of two articles published by our research group related to the role of food intolerance in the pathogenesis of IBS published in 2004 and 2010, respectively. 5,6 In these trials, we have already emphasized the importance and frequency of atopy and hyperreactivity in patients with IBS.

Keywords: Irritable bowel syndrome, Food intolerance, Histamine, Atopy, Digestive symptoms.

1 INTRODUCTION

Irritable bowel syndrome (IBS) remains a clinical challenge in the 21st century. It's the most commonly diagnosed gastrointestinal condition and also the most common reason for referral to gastroenterology clinics. 1Its can affect up to one in five people at some point in their lives, and has a significantly impact of life quality and health care utilization. The diagnosis of IBS is not confirmed by a specific test or structural abnormality. Today the Rome Criteria III is the current gold-standard for the diagnoses of IBS. Various mechanisms and theories have been proposed about its etiology, but the biopsychosocial model is the most currently accepted for IBS. However, about two-thirds of IBS

patients experience clinical symptoms induced by food intolerance , including gastrointestinal symptoms such as abdominal pain , bloating , diarrhea or constipation. Common types of food intolerance include lactose intolerance , gluten intolerance ,FODMAP intolerance , and histamine intolerance , among which lactose intolerance and FODMAP intolerance are more common in IBS patients. The exact mechanism by which food intolerance is involved in IBS is not fully understood. The complex of symptoms would be the result of the interaction between psychological, behavioral, psychosocial and environmental factors. Recently, some studies show the possible role of histamine and its relationship to non-allergic intolerance as a mediator of clinical digestive manifestations in patients with IBS.3,4 In this chapter we will discuss the role of food intolerance in IBS through a summary of two articles published by our research group related to the role of food intolerance in the pathogenesis of IBS published in 2004 and 2010 respectively. 5,6 In these trials we already emphasized the importance and frequency of atopy and hyperreactivity in patients with IBS.

1.1 CORRELATION BETWEEN SYMPTOMS OF THE IRRITABLE BOWEL SYNDROME AND THE RESPONSE TO THE FOOD EXTRACT SKIN PRICK TEST

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The relationship between the irritable bowel syndrome (IBS) and food intolerance is not clear. We studied the cutaneous response to food antigens in 43 volunteers who were students and employees of the Faculty of Medicine of Universidade Federal Fluminense. Subjects were divided into 3 groups after evaluation for Roma II criteria forfunctional disease of the gastrointestinal tract: group I, 14 volunteers with IBS; group II, 15 volunteers with functional dyspepsia; group III, 14 volunteers without habitual gastrointestinal symptoms. The subjects were submitted to the skin prick test with 9 food antigen extracts, for a total of 387 skin tests (9 per volunteer). Of the 126 tests applied to group I, 24 (19.4%) were positive (a 3-mm wider papule than the negative control) and of the 135 tests applied to group II, 3 (2.3%)were positive. Of the 126 tests applied to group III, 6 (4%) were positive. The number of positive responses obtained in group I (IBS) differed significantly from the other 2 groups ($P < 0.01$). None of the volunteers with IBS reported intolerance to any isolated food. The higher reactivity to food antigens in group I compared to groups II andIII suggests that intestinal permeability may be increased in patients with IBS.

Over the last decade, the study of functional diseases of the gastrointestinal tract (FGD), especially irritable bowel syndrome (IBS), has been gaining importance in the field of gastroenterology (1-3). Unlike most of the diseases of the digestive tract which can be diagnosed using biological markers (1,4), FGD can only be diagnosed using clinical approaches, presuming the absence of

structural or biochemical dysfunction in the generation of the symptoms (5-9). IBS is one of the most common diseases in clinical practice. Symptoms of IBS (episodes of abdominal pain associated with alterations in intestinal habits occurring more than six times a year), are observed in 10% of the general population. The prevalence estimates vary from 9 to 22% depending on the population studied (2,3,6). The mechanisms involved in the pathophysiological alterations found in FGD seem to be multiple and are still uncertain. A unifying hypothesis for the generation of these symptoms would be the phenomenon of visceral hypersensitivity identified in most of the patients with IBS (7). The phenomenon of visceral hypersensitivity may be related to an increased response of the neuroimmune circuits in the nervous system or gastrointestinal tract to external stimuli (for example environmental or psychosocial stimuli) or internal ones (tissue irritation, inflammation, infection) (4,5,7). This increased response may result in abnormalities of digestive motility, inducing symptoms compatible with the clinical picture of IBS. In synthesis, an abnormal neuroimmune interaction (genetic and psychosocial factors, food intolerance, bacterial microflora)may contribute to the phenomenon of visceral hypersensitivity frequently observed in the patients with IBS (1,4,5,6-9). Clinically, the frequency of IBS is higher among females and is associated with psychological stress, food intolerance (adverse reaction to a specific food or ingredient that is not immune mediated or associated with psychological phenomena), intestinal infections, and even previous abdominal surgeries(1,2,6,8,10). The pathogenesis of food intolerance, frequently associated with IBS symptoms, has been little studied.

The aim of the present study was to correlate symptoms of IBS with the response to food antigens using the skin prick test. Westudied the response to food antigens by the prick test in 43 volunteers, 27 women and 16 men, during the period from August 2002 to January 2003. The subjects were selected from 105 volunteers, students and employees of the Faculty of Medicine, Universidade Federal Fluminense, Niterói, RJ, Brazil, recruited through a poster affixed on the door of the group of study of intestinal diseases(outpatient unit), Hospital Universitário Antonio Pedro. The inclusion criteria were age above 18 years and volunteers from the general population. This approach was used in order to obtain a population sample that would not consist of ambulatory or hospital patients, but that would represent the population in general. The exclusion criterium was the diagnostic suspicion of organic disease of the gastrointestinal tract. The study consisted of 2 stages taking place over 2 consecutive weeks. Stage I. Clinical evaluation of the volunteers, including the application of Roma II criteria (1) for the determination of IBS (pain or abdominal discomfort accompanied by 2 or 3 symptoms, such as relief with defecation and/or with alterations in the frequency of evacuations or in the shape of the feces forat least 12 weeks, which need not be consecutive, in the preceding 12 months; in the absence of organic disease of the gastrointestinal tract and functional dyspepsia, persistent or recurrent symptoms, such as pain or discomfort in the upper abdomen at least 12 weeks earlier, not necessarily serial, during the preceding 12 months). Stage II. Application of skin tests using food

antigens by the prick test. Of the 105 volunteers, 30 were excluded because of a diagnostic suspicion of organic disease of the gastrointestinal tract and were scheduled for later outpatient consultation, 10 did not agree to be submitted to the skin tests, and 22 did not return the following week for the scheduled skin tests. The 43 selected volunteers were divided into 3 groups after clinical evaluation and the application of Roma II's approaches for IBS and functional dyspepsia. Group I consistedof 14 volunteers with a diagnosis of IBS (10 women and 4 men; mean age 25years), group II consisted of 15 volunteers with a diagnosis of functional dyspepsia (9 women and 6 men; mean age 26 years), and group III consisted of 14 volunteers without habitual previous symptoms of gastrointestinal tract disease (8 women and 6 men; mean age 28 years). The three groups were submitted to the skin tests with 9 food extracts (egg white,egg yolk, peanut, chestnut, wheat flour, cow milk, soy, crustaceans, and chocolate). We used the commercially available allergenic reagents (M. Queiroz Laboratory,Rio de Janeiro, RJ, Brazil) in 50% glycerin diluent. The antigens were applied on the volar surface of the forearm in droplets (25 ml of testing reagent) by the technique of percutaneous puncture (11) using identical needles and were discarded after each test to avoid cross-reactions due to allergen absorption at multiple skin sites. Twenty minutes after antigen application, the skin tests were read by measuringthe diameter of the papule in millimeters. A papule 3 mm wider than the negative control was considered to be a positive response,whereas any smaller value was considered to be negative (11). The study was approved by the Health Research and Post-Graduation Adviser Committee, Research and Pos-Graduation Department,UFF.

A total of 387 skin tests were applied to the 3 groups (9 for each volunteer). In group I, IBS, 24 positive responses were obtained, corresponding to 19.4% of the 126 tests performed. In group II, functional dyspepsia,3 positive responses were obtained, corresponding to 2.3% of the 135 tests performed. In group III, 6 positive responses were obtained, corresponding to 4% of the 126 tests performed (Table 1). The positive responses were not concentrated in 1 or 2 individuals in each group but were dispersed throughout the group. Ten volunteers with IBS presented a positive response to one or more food antigens but the positive response was not specifically associated with IBS crises in any of them. The number of positive response was not significantly different between groups II and III. In group I, IBS, the number of positive responses differed significantly from the values obtained in the other 2 groups ($P < 0.01$,Student t-test). The present results agree with those reported by others. The association between IBS and sensitivity to multiple foods has also been reported in most of the few available studies in the literature (10,12). None of the volunteers with IBS reported intolerance to any isolated food (10,13,14). This finding suggests that patients with IBS symptoms have difficulties with foods in general. It is very probable that IBS causes food intolerance and not the opposite (15- 19). Despite the small number of cases studied,the higher reactivity to food antigens in group I compared to groups II and III adds a new information and suggests the presence of a possible alteration in

intestinal epithelial function (20). The association between phenomena of food hypersensitivity and IBS symptoms is still open to question. Future clinical investigations on larger samples using tests of intestinal permeability will be useful for abetter understanding of the results obtained here.

The traditional pharmacologic management of IBS has been symptom based and several drugs have been used. However, the cornerstone of its therapy is a solid patient physician relationship. IBS has no definitive treatment but could be controlled by non-pharmacologic management eliminating of some exacerbating factors such certain drugs, stressor conditions and changes in dietary habits.

In this chapter we review the types of food intolerance in IBS and the role of food intolerance in the pathogenesis and intervention of IBS. Irritable bowel syndrome is a common functional gastrointestinal disorder, and more studies have found that food intolerance is involved in the pathogenesis of IBS.

This review will provide a summary of pathophysiology, diagnostic criteria and current and emerging therapies for IBS

1.2 THE PREVALENCE AND CLINICAL CHARACTERISTICS OF ATOPIC MANIFESTATIONS IN PATIENTS WITH IRRITABLE BOWEL SYNDROME IN A BRAZILIAN URBAN COMMUNITY

Irritable bowel syndrome (IBS) is a common chronic disorder characterized by recurrent abdominal pain, bowel movement changes, diarrhea, constipation, or both and affect approximately 10-20% of the general population. Today, IBS is considered a disorder of dysregulation of the so called brain-gut axis and evidence also suggests that gastrointestinal inflammation may be of great importance in the majority of cases of IBS. In addition to gastrointestinal symptoms, many patients have atopic symptoms. The aim of this study was to study the prevalence of atopic manifestations in volunteers with IBS in a Brazilian urban community. Volunteers over 18 years of age were enrolled and evaluated. The participants were evaluated by a gastroenterologist of the Group of Study of Intestinal Diseases at Hospital Universitario Antonio Pedro. All volunteers were evaluated to determine if patients had symptoms compatible with the diagnosis of IBS based on Rome III criteria. The identification of the atopic manifestations was based in a structured questionnaire for atopy. Three hundred and fifty volunteers were enrolled. Of them, 330 volunteers were evaluated: 78(23.6%) of the volunteers had symptoms compatible with IBS (Group I) and 252 (76.3%) without symptoms compatible with IBS (Group II). Atopic manifestations were present in 46 (65.3%) in Group I and 105 (41. 0%) in Group II(P=0.0107, OR-2.01 95%CI -1. 20-3. 37). The association between atopic manifestations and the presence of IBS was relevant in patients in this Brazilian urban community. This fact may have implications for diagnosis and treatment of patients with IBS.

Irritable bowel syndrome (IBS) affects 10- 20% of the general population and is the most common reason for patients to consult a gastroenterologist. It is often accompanied by gastrointestinal intestinal and extra-intestinal symptoms.1-6 The extra-intestinal symptoms associated to IBS may be correlated with an increase in seeking medical advice, a worse prognosis, and a reduced quality of life.7-11 The high prevalence of extra-intestinal symptoms or comorbidities in IBS patients has led investigators to develop a hypothesis regarding underlying pathophysiological mechanisms of these disorders.12-14 IBS has been associated with female gender, psychological distress, food intolerance (reproducible adverse reaction to a specific food or food ingredient which is not immune mediated or psychologically based), enteric infections, and previous abdominal surgery.15-21 Today IBS is considered a disorder of dysregulation of the so called brain-gut axis and there is evidence to also suggest that inflammation with the gastrointestinal tract may be of great importance in the majority of IBS patients.22,23Approximately 30% of patients with IBS identify acute infection as an initial trigger for their chronic intestinal infections.17,18,21 These findings led to speculation that the immune system may play a role in the pathogenesis of at least a subpopulation of IBS patients.24-27 In recent studies, excess prevalence of bronchial hyper-responsiveness has been verified among patients with irritable bowel syndrome. 27 Tobin et al. reported that adults with such atopic symptoms have a high incidence of IBS, suggesting a link between atopy and IBS.28 Studies of atopic symptoms or comorbidities are of great scientific interest. Such studies can contribute to the experimental development of a new pathogenesis of IBS.11-14 Assessment and improved understanding of atopic somatic symptoms in IBS patients might allow new sub-groups of IBS patients with special characteristics to be identified and therebylead to the creation of new therapeutic concepts.12,13 Distinguishing atopic IBS from nonatopic IBS could help design more appropriate clinical interventions.11, 14,28 This paper aims to study the prevalence of atopic manifestationsin volunteers with IBS in a Brazilian urban community.

2 MATERIALS AND METHODS

Adult volunteers aged 18 and over, residents in Niterói, RJ, Brazil were enrolled during a 2-year period from January 2006 to January2008. The study was approved by the local ethical committee (n. CAE 0109025800007) and by our institutional review board (IRB) at theFaculty of Medicine. The volunteers were selected from students and employees of the Federal Fluminense University, Faculty of Medicine, Computer Science and Social Sciences, Niterói, RJ, Brazil. They were recruited through a poster affixed on the door of the Group of Study of Intestinal Diseases(Outpatients Unit), Hospital Universitário Antonio Pedro. This approach was used inorder to obtain a population sample that would not consist of ambulatory or hospital patients and that would represent the population in general. The exclusion criteria included: those with the diagnostic suspicion of organic disease of the

gastrointestinal tract (including positive stool examination for ova and parasites)and those unable to complete the questionnaire. All participants were provided withan IRB-approved information sheet that described the purpose of the study, the voluntary nature of the study, the study aims, methods,and population, and were given opportunities to ask questions. The volunteers were evaluated in our outpatient's clinic at theUniversity Hospital Antonio Pedro (HUAP). After obtaining informed consent, the volunteers went through a complete clinical evaluation. Diagnosis of IBS was based on the Rome III criteria for IBS. These were recurrent abdominal pain or discomfort at least three days per month in the last three months associated with 2 or more of the following: i)improvement with defecation; ii) onset associated with a change in frequency of stool; iii) onset associated with a change in form (appearance) of stool. The volunteers were also asked questions to identify atopic manifestations(seasonal runny nose, nasal congestion,itchy eyes, asthma, food allergy, reactions that cause skin rash, food intolerance triggering digestive symptoms). A total of 330 volunteers completed the surveys. Twenty volunteers were excluded because they presented the diagnostic suspicion of organic disease of the gastrointestinal tract (including positive stool examination for ova and parasites). Statistical analysis :Analysis of categorical data was carried out using c2 or Fisher's exact test, and continuous data were analyzed using independent sample t-test. Odds ratios (OR) with 95% confidence intervals (CI) were used to measure the associations between the comorbid conditions. $P<0.05$ was considered significant. The analysis was performed using SAS version 9.1 (SAS)Institute, Inc., Cary, NC, USA).

3 RESULTS

Three hundred and fifty volunteers (177 women and 173 men) were enrolled in the study. Twenty volunteers who had diagnostic suspicion of organic disease of the gastrointestinaltract were excluded. A total of 330 volunteers completed the surveys. After evaluation of the 330 volunteers, 78 (23.6%, mean age 27.6±8.7 years, 60 female and 18 male) of them met the diagnostic criteria for IBS (Group I-GI). The other 252 (76.3%, mean age 32.4±10 years, 106 female and 146 male) were healthy without symptoms of IBS (Group II - GII). There was no significant difference in the mean age of the 2 groups ($P>0.05$). We also found that the number of female volunteers with diagnosis of IBS was significantly higher than that of male volunteers ($P<0.05$)

Atopic manifestations were present in 46 (65.3%) volunteers of group I and 105 (41.0%)in GII. Thirty (65.2%) of the volunteers with IBS had respiratory atopy (26 seasonal allergic rhinitis and 4 asthma), compared with 65 (61.9%) (55 seasonal allergic rhinitis and 10 asthma) of volunteers without IBS. In addition, 16 volunteers with IBS (34.7%) had allergic skin manifestations compared with 45 (42.8%)volunteers without IBS. The percentage of atopic manifestations in volunteers with IBS (GI) was significantly higher than that of GII ($P=0.0107$, OR-2.01 95%CI -1, 20-3, 37). Twenty-nine

(37.1%) volunteers with IBS reported that a particular food or multiple foods caused abdominal cramping, but the food intolerance was not specifically associated with IBS crises in any of them (Table 1). Sixteen (76.1%) of the 21 volunteers with IBS diarrhea predominant (D-IBS) and 11 (73.3%) of the 15 IBS constipation predominance(C IBS) volunteers had atopic manifestations. Seven (70%) of the 10 mixed IBS (m-IBS) volunteers had allergic complaints. The presence of atopic manifestations was similar between IBS sub-type groups (P>0.05). Discussion :Irritable bowel syndrome is a common disorder worldwide and estimates of prevalence ranged from 9-22% depending upon the population group studied. The prevalence of symptoms consistent with IBS in the present study, the female predominance and mean age were similar to that reported in the literature. IBS appears to be equally common in the Third World, and we suggest that it can be considered a transcultural functional disorder.1,2,4,6,15 In the present study, we investigated the prevalence of atopic manifestations in volunteer non-patients with IBS. We have shown that volunteers with IBS had a higher percentage of allergic symptoms when compared with those without IBS. This finding suggests that there is an association between IBS and allergy history.

The exact IBS pathophysiology remains unknown and the role of allergic reactions in the pathophysiology of IBS remains controversial. 21,23,24 However, recent interest has been directed to the possible participation of intestinal inflammatory mediators in the pathophysiology of IBS. Mucosal abnormalities such as colonic mastocytosis have been reported in some recent studies.19,21,22 Tobin et al.27 reported that adults with atopic symptoms report a high incidence of IBS suggesting a link between atopy and IBS. They proposed a new IBS subgroup of patients with atopic symtoms. Our results confirmed the association between IBS and atopic disorders in our study population. IBS is diagnosed by symptomatic criteria rather than biological markers. Clinical subtypes of IBS are based on the predominant symptoms, such as diarrhea predominant (DIBS) IBS, constipation predominant IBS (CIBS) and mixed IBS (M IBS).4,29 Dunlop et al.29 reported a significant correlation among atopy and increased intestinal permeability in a subset of IBS patients. We showed in a previous study that the number of positive responses to a skin prick test for food antigens was significantly greater in a D-IBS group of patients than in the other two groups (C IBS and M IBS).30 The report of a significant correlation among atopy and increased intestinal permeability suggests that the immune system may play a role in IBS pathogenesis of at least a subpopulation of IBS patients.30-33 In the current study, we didn't find a significant association between personal history of allergies and IBS clinical sub-type, but the present results confirm the association between allergy and IBS.23 Twenty-nine volunteers with IBS reported intolerance to multiple foods that caused abdominal cramping, but the food intolerance was not specifically associated with IBS crises in any of them. We could not find evidence that suggests a correlation between IBS crises and specific food intolerance in these subjects. This subjective report of adverse food reaction could represent a non-allergic immunological reaction. In a

previous study,24 we reported that volunteers with a diagnosis of IBS reported higher reactivity to food antigens when compared to patients with functional dyspepsia. We suspect that IBS causes the food sensitivity rather than food sensitivity causes IBS. It is still unclear whether diet is a key factor in exacerbating IBS symptoms and whether dietary manipulation is a valid treatment.34-39 Recent studies reported a high prevalence of bronchial hyper-responsiveness among patients with irritable bowel syndrome. The Atopic manifestations were present in 46 (65.3%) volunteers of group I and 105 (41.0%) in GII. Thirty (65.2%) of the volunteers with IBS had respiratory atopy (26 seasonal allergic rhinitis and 4 asthma), compared with 65 (61.9%) (55 seasonal allergic rhinitis and 10 asthma) of volunteers without IBS. In addition, 16 volunteers with IBS (34.7%) had allergic skin manifestations compared with 45 (42.8%) volunteers without IBS. The percentage of atopic manifestations in volunteers with IBS (GI) was significantly higher than that of GII (P=0.0107, OR-2.01 95%CI -1, 20-3, 37). Twenty-nine (37.1%) volunteers with IBS reported that a particular food or multiple association between IBS and asthma has also been reported by Ozol et al.40 These investigators hypothesized a shared respiratory and gastrointestinal pathopyisiological mechanism which produced smooth muscle hyperactivity. In our study, the number of IBS volunteers with asthma was not significantly higher than that of volunteers without IBS. In summary, the present results confirm the association between allergy and IBS and add new information about the possible participation of intestinal inflammatory mediators in the pathophysiology of IBS.17,20-22,34,35,39,40 Further studies are needed to clarify this association. The identification of IBS patients with different clinical sub-types could improve therapeutic options and prevention strategies of IBS.In summary, the present results confirm the association between allergy and IBS and add new information about the possible participation of intestinal inflammatory mediators in the pathophysiology of IBS.17,20-22,34,35,39,40 Further studies are needed to clarify this association. The identification of IBS patients with different clinical sub-types could improve therapeutic options and prevention strategies of IBS.

REFERENCES

Soares RL. Irritable bowel syndrome: a clinical review. World J Gastroenterol. 2014 Sep 14; 20(34):12144-60. doi: 10.3748/wjg.v20.i34.12144. PMID: 25232249; PMCID: PMC4161800.

Soares RL, Figueiredo HN, Santos JM, Oliveira RF, Godoy RL, Mendonca FA. Discrepancies between the responses to skin prick test to food and respiratory antigens in two subtypes of patients with irritable bowel syndrome. World J Gastroenterol. 2008 May 21; 14(19):3044-8. doi: 10.3748/wjg.14.3044. PMID: 18494056; PMCID: PMC2712172.

Shulpekova YO, Nechaev VM, Popova IR, Deeva TA, Kopylov AT, Malsagova KA, Kaysheva AL, Ivashkin VT. Food Intolerance: The Role of Histamine. Nutrients. 2021 Sep 15; 13(9):3207. doi: 10.3390/nu13093207. PMID: 34579083; PMCID: PMC8469513.

Zhang XR, Zhang YL. Progress in understanding of relationship between irritable bowel syndrome and food intolerance. Shijie Huaren Xiaohua Zazhi 2022; 30(20): 886-891. https://dx.doi.org/10.11569/wcjd.v30.i20.886

Soares, R. L. S., Figueiredo, H. N., Maneschy, C. P., Rocha, V. R. S., & Santos, J. M.. (2004). Correlation between symptoms of the irritable bowel syndrome and the response to the food extract skin prick test. Brazilian Journal of Medical and Biological Research, 37(5), 659–662. https://doi.org/10.1590/S0100-879X2004000500005

Soares, R.L.S.; Figueiredo, H.N.; Moreira Filho, P.F.; Oliveira, R.F.; Gonçalves, C.D.; Micuci, A.J.Q.R.; Parada, B.A.; Brandão, I.B.; Rodrigues, C.C. The Prevalence and Clinical Characteristics of Atopic Manifestations in Patients with Irritable Bowel Syndrome in a Brazilian Urban Community. Gastroenterol. Insights 2010, 2, e11. https://doi.org/10.4081/gi.2010.e11

Drossman DA, Corazziari E, Talley NJ, Thompson WG & Whitehead WE (2000). Rome - The Functional Gastrointestinal Disorders. 2nd edn. Allen Press, McLean, VA, USA.

Locke GR (1996). The epidemiology of functional gastrointestinal disorders in North America. Gastroenterology Clinics of North America, 25: 1-19.

Talley NJ, Zinsmeister HR & Mellton LJ (1995). Irritable bowelsyndrome in a community: symptom subgroups, risk factors, andhealth care utilization. American Journal of Epidemiology, 142: 76-83.

Mayer EA & Collins SM (2002). Evolving pathophysiologic models of functional gastrointestinal disorders. Gastroenterology, 122: 2032-2048.

Downing JE & Miyan JÁ (2000). Neural immunoregulation: emerging roles for nerves in immune homeostasis and disease. Immunology Today, 21: 281-289.

Jones R & Lydeard S (1992). Irritable bowel syndrome in the general population. British Medical Journal, 304: 87-90.

Cooke HJ (2000). Neurotransmitters in neuronal reflexes regulating intestinal secretion. Annals of the New York Academy of Sciences, 915: 77-80.

Toner BB & Akman D (2000). Gender role and irritable bowel syndrome: literature review and hypothesis. American Journal of Gastroenterology, 95: 11-16.

Barbara G, De Giorgio R, Stanghellini V, Cremon C & Corinaldesi R (2002). A role for inflammation in irritable bowel syndrome? Gut, 51 (Suppl I): I-141-I-144.

Crowe SE & Perdue MH (1992). Gastrointestinal food hypersensitivity: basic mechanisms of pathophysiology. Gastroenterology, 103:1075-1095.

Bernstein L & Storms WW (1995). Practice parameters for allergic testing. Annals of Allergy, Asthma, and Immunology, 75: 543-625.

Brandtzaeg P (2002). Current understanding of gastrointestinal immunoregulation and its relation to food allergy. Annals of the New York Academy of Sciences, 964: 13-45.

Ahmed T & Fuchs GJ (1997). Gastrointestinal allergy to food: a review. Journal of Diarrhoeal Diseases Research, 15: 211-223.

Nice AM, Frankum B & Talley NJ (1998). Are adverse food reactionslinked to irritable bowel syndrome? American Journal of Gastroenterology,93: 2184-2190.

Jenkins L & Zwetchkenbaum R (1988). The irritable bowel syndrome and food hypersensitivity. Annals of Allergy, 61: 47-49.

Locke GR, Zeismeister AR, Talley NJ, Kett SL & Melton LJ (2000). Risk factors for irritable bowel syndrome: role of analgesics and food sensitivities. American Journal of Gastroenterology, 95: 157-165.

Petitpierre M, Gumowski P & Girard JP (1985). Irritable bowelsyndrome and hypersensitivity to food. Annals of Allergy, 54: 538-540.

Soares RLS, Figueiredo HN, Dick MFS, Silva Filho NF, Lima LFQ & Santos JM (2001). Irritable bowel syndrome associated with food intolerance - creation of a clinical-epidemiological profile regional. Evaluation in two Brazilian geographic regions - Southeast and Amazon. World & Life, 2:20-32.

Jones VA, Shorthouse M, McLaughlan P, Workman E & Hunter JO (1982). Food intolerance: a major factor in the pathogenesis of irritable bowel syndrome. Lancet, ii: 1115-1117.

Unno N & Fink MP (1998). Intestinal epithelial hyperpermeativity mechanisms - relevance to disease. Gastroenterology Clinics of North America, 27: 289-307.

Saito YA, Schoenfeld P, Locke GR 3rd. The epidemiology of irritable bowel syndrome in North America: a systematic review. Am J Gastroenterol 2002;97:1910-5.

Talley NJ, Zinsmeister HR, Mellton LJ. Irritable bowel syndrome in a community: symptoms subgroups, risk factors, and health care utilization. Am J Epidemiology 1995;142:76-83.

Jones R, Lydeard S. Irritable bowel syndrome in the general population. BMJ 1992;304:87-90.

Drossman DA, Camilleri M, Mayer EA, et al. AGA technical review on irritable bowel syndrome. Gastroenterology 2002;123: 2108-31.

Quigley EM, Bytzer P, Jones R, et al. Irritable bowel syndrome: the burden and unmet needs in Europe. Dig Liver Dis 2006;38:717-23.

Soares RLS, Santos JM, Rocha VRSR. Prevalence of irritable bowel syndrome in a Brazilian Amazon community. Neuro - gastroenterol Motil 2005;17:883.

Maxion-Bergemann S, Thielecke F, Abel F, et al. Costs of irritable bowel syndrome in the UK and US. Pharmacoeconomics 2006;24:21-37.

Gralnek IM, Hays RD, Kilbourne A, et al. The impact of irritable bowel syndrome on health-related quality of life. Gastroenterology 2000;119:654-60.

Talley NJ, Gabriel SE, Harmsen WS, et al. Medical costs in community subjects with irritable bowel syndrome. Gastroenterology 1995;109:1736-41.

Whitehead WE, Olafur P, Jones KR. Systematic review of the comorbidity of irritable bowel syndrome with other disorders: what are the causes and implications? Gastroenterology 2002;122:1140-56.

Vandvik PO, Wilhelmsen I, Ihlebaek C, et al. Comorbidity of irritable bowel syndrome in general practice: a striking feature with clinical implications. Aliment Pharmacol Ther 2004;20(Suppl.):1-9.

Riedel A, Schmidtmann M, Stengel A, et al.Somatic comorbidities of irritable bowel syndrome: a systematic analysis. J Psychosom Res 2008;64:573-82.

Bonavita V, De Simone R. Towards a definition of comorbidity in the light of clinical complexity. Neurol Sci 2008;29:S99-S102.

Toner BB, Akman D. Gender role and irritable bowel syndrome: literature review and hypothesis. Am J Gastroenterol 2000;95: 11-16.

Mayer EA, Collins SM. Evolving pathophysiologic models of functional gastrointestinal disorders. Gastroenterology 2002;122: 2032-48.

Neal KR, Barker L, Spiller RC. Prognosis in post-infective irritable bowel syndrome: a six year follow-up study. Gut 2002;51:410-3.

Mckeow N, Parry SD, Stansfield JR, et al. Ons IBS may occur after non-gastrointestinal and intestinal infection. Neurogastroenterol. Motil 2006;18:839-43.

McLean PG, Calver AR, Alpers DH, et al. The emerging role of the microbial-gastrointestinal neural axis. Gastroenterology Insights 2009;1:e3:7-11.

Barbara G, DeGiorgio R, Stranghellini V, et al. New pathophysiological mechanisms irritable bowel syndrome. Aliment

Mach T. The brain-gut axis in irritable bowel syndrome – clinical aspects. Med Sci Monit 2004;10:RA125-31.

Collins SM. Is the irritable gut an inflamed gut? Scand J Gastroenterol 1992;Suppl 192;102-5.

Dainese R, Galliani EA, Lazzarini F, et al. Discrepance between reported food intolerance and sensitization test findings in IBS patients. Am J Gastroenterol 1999;94: 1892-7.

Soares RLS, Figueiredo HN, Maneschy C, et al. Correlation between symptoms of the irritable bowel syndrome and the response to the food extract skin pricktest. Braz J Med Biol Res 2004;37:659-62.

Yazar A, Atis S, Konca K, et al. Respiratory symptoms and pulmonary functional changes in patients with IBS. Am J Gastroenterol 2001;96:1511-6.

Kennedy TM, Jones RH, Hungin AP, et al. Irritable bowel syndrome, gastrooesophageal reflux, and bronchial hyperresponsiveness in the general population. Gut 1998;43:770-4.

Jun Dw, Oy L, Yomm Hj, et al. Bronchial hyperrresponiveness in IBS. Dig Dis Sci 2005;50:1688-91.

Tobin M C, Moparty B, Farhadi A, et al. Atopic irritable bowel syndrome: a novelsubgroup of irritable bowel syndrome with allergic manifestations. Ann Allergy Asthma Immunol 2008;100:49-53.

Drossman DA, Corazziari E, Talley NJ, et al. Rome III–A multinational consensus document on functional gastrointestinal disorders. Gastroenterology 2006;130: 1480-91.

Dunlop SP, Hebden J, Naesdal J, et al.Abnormal intestinal permeability in subgroups of diarrhea predominant IBS. Am J Gastroenterol 2006;101:1288-94.

Camilleri M, Gorman H. Intestinal permeability and IBS. Neurogastroenterol Motil 2007;19:545-52.

Soares RLS, Figueiredo HN, Santos JM, etal. Discrepancies between the responses to skin prick test to food and respiratory antigens in two subtypes of patients withirritable bowel syndrome. World J Gastro -
enterol 2008;14:3044-8.

Barbara G. Mucosal barrier defects in irritablebowel syndrome. Who left the door open? Am J Gastroenterol 2006;101:1295-8.

Jun DW, Lee Oy, Yoon HJ, et al. Food intolerance and skin prick test in treated and untreated irritable bowel syndrome. World J Gastroenterol 2006;12:2382-7.

Zar S, Benson MJ, Kumar D. Food. Specific serum IgG4 and IgE titers to common food antigens in irritable bowel syndrome. Am J Gastroenterol 2005;100:1550-7.

Zuo XL, Li YQ, LI WJ, et al. Alterations of food antigen-specific serum immunoglobulins G and E antibodies in patients with irritable bowel syndrome and functional dyspepsia. Clin Exp Allergy 2007;37:823- 30.

Locke GR 3rd, Zinsmeister AR, Talley NJ, et al. Risk factors for irritable bowel syndrome: role of analgesics and food sensitivities.Am J Gastroenterol 2000;95:157- 65.

Jones VA, McLaughan P, Shorthouse M, et al. Food intolerance: a major factor in the pathogenesis of irritable bowel syndrome.Lancet 1982;2:1115-7.

Zwetchkenbaum J, Burakoff R. Irritable bowel syndrome and hypersensitivity.Ann Allergy 1988;61:47-9

Ozol D, Uz E, Bozalan R, et al. Relation shipbetween asthma and Irritable bowel syndrome:role of food allergy. Journal of Asthma 2006;43:773-5.

Camilleri M. Treating irritable bowel syndrome:overview, perspective and future therapies. Br J Pharmacol 2004;141:1237-48.

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ABSTRACT
Infeccious Tenosynovitis is a disease that affects tendon sheath, normal hand tendons . The origin can be hematogenous, trauma dito inoculation of pathogens ir local spread. This study aims to evaluate the use of ultrasound examination in the diagnostic approach and therapeutic follow-up in patients with tenosynovitis. This is a systematic review study, which had the PUBMED and SCIENCE DIRECT databases as a research source, selecting studies between the years 2018 and 2023. 15 articles that responded to the proposed objective and suited the criteria were analyzed. of inclusion. It was possible to verify that patients affected by infectious tenosynovitis are generally male (53.3%). They are usually over 30 years old (80.0%), and may also affect children (20.0%). Most individuals were diagnosed with pyogenic flexor tenosynovitis (53.3%). All studies used ultrasound as one of the diagnostic methods (100.0%). Among the treatments used, there was a higher prevalence of antibiotic therapy (86.6%) and surgical debridement (40.0%). According to the analysis carried out, it was possible to verify that ultrasound at the bedside is an important imaging modality, and its use should be considered in patients with suspected pyogenic tenosynovitis, due to its speed and greater sensitivity, as it makes it possible to treat the patient without surgical intervention and helps in choosing the best treatment.

Keywords: Tenosynovitis, Hand, Pyogenic.

1 INTRODUCTION

The human hand, due to its multiple functionality and constant exposure, can be injured more easily during daily activities, being the target of infections. Such acute hand infections can be superficial, when they affect the skin and subcutaneous tissue, or deep, when there is involvement of tendons, extensor and/or flexor compartments, bursae or even bone [1]. The loss of skin integrity allows contact with microorganisms in deep layers, with *Staphylococcus aureus,* Streptococcus β-haemolytic*, and* gram-negative *bacteria being more prevalent* [2]. However, immunocompromised patients may be affected by rare pathogens. In the case of tenosynovitis, which is triggered by microorganisms that reach tendons through the bloodstream, ultrasound examination becomes a rapid option for diagnosis and therapeutic definition [3].

Ultrasonography (US) is a valuable first-choice tool for visualizing traumatic, inflammatory, and degenerative conditions of the extensor and flexor tendons, particularly with the advantage of a possible dynamic examination [4]. The additional use of duplex Doppler ultrasound and power Doppler

is recommended for detection of tenosynovitis in overuse injury, inflammatory disease, infection, and after traumatic conditions [5].

US is the most convenient imaging test for hand infection. It is readily available, real-time, and easily obtainable, harmless, and inexpensive, with no need for sedation in children [6]. In addition, it can help differentiate a deep pyogenic flexor tenosynovitis-type infection or hematogenous disseminated infection from a distant site [7]. It can also detect the presence of a foreign body in soft tissue, the presence and edges of an abscess, and the integrity of deep anatomical structures [7,8].

Although surgical treatment is relatively well standardized [8], there is no consensus on the role of antibiotic therapy and its parameters in this condition [9,10]. With the exception of the rare incipient forms that present very early, antibiotic therapy alone is not recommended for the treatment of pyogenic flexor tenosynovitis (PFT). Urgent surgical care is required to flush the tendon sheath [8,10]. Several surgical techniques have been shown to be effective, such as continuous irrigation or, more recently, ultrasound-guided lavage [11]. However, the most commonly used flexor sheath washing techniques are conventional open or minimally invasive ones. Postoperative antibiotic therapy is initiated after specimens are collected for microbiology [8].

From this perspective, the general objective of the present study was to evaluate the use of ultrasound in the diagnostic approach and therapeutic follow-up in patients with tenosynovitis. And specifically, to analyze the profile of patients with infectious tenosynovitis; identify the usefulness of ultrasound in the definitive diagnostic aid, differential diagnosis and use for therapeutic follow-up; and to verify the risk factors and groups associated with infectious tenosynovitis.

2 MATERIALS AND METHODS

2.1 NATURE OF THE STUDY

This is a systematic review of the literature, and followed the methodological criteria established by Donato & Donato [12]. It was carried out in accordance with the Prefer Reporting Items for Systematic Reviews and Meta-Analyses Guidelines (PRISMA), described by Galvão et al. [13].

The research was based on the following guiding question: "What is the importance of using ultrasound in the diagnosis of tenosynovitis?", elaborated according to the PICO strategy (Population: individuals with tenosynovitis; Intervention: use of ultrasound in diagnosis; Comparison: other types of exams and Outcomes (outcome: result or contribution of the exam).

The electronic search was conducted between June and July 2023 using the following databases: Pubmed/Medline and Science Direct. The terms used in the search were: "ultrasound, hand, tenosynovits" OR "ultrasound, pyogenic, tenosynovits, flexor". These terms were obtained from the DeCS (Descriptors in Health Sciences) and from the articles studied. A comprehensive examination of the reference sections of all identified articles was conducted to identify other relevant manuscripts.

2.2 INCLUSION CRITERIA

Patients with tenosynovitis; use of ultrasound in diagnosis and/or follow-up; Articles published in full in English or Portuguese by the year 2023.

2.3 EXCLUSION CRITERIA

Articles published more than five years old; studies not available in English or Portuguese; articles that do not have open access; studies that addressed tenosynovitis triggered by rheumatologic diseases.

2.4 METHOD OF DATA COLLECTION

Two reviewers read the titles and abstracts of the retrieved articles using the predefined search strategy and applied the inclusion criteria independently in order to reduce the risk of interobserver bias. Then, the pre-selected articles and also the articles that did not contain abstracts were obtained in full and read again, applying the same eligibility criteria. Subsequently, two other reviewers independently analyzed the texts in full, using the same pre-established criteria. Cases of disagreement were resolved by discussion, and agreement was reached in all cases to establish the studies included in the systematic review.

Included studies were selected from the title, abstract, or full text when available. It was decided to include all types of articles, especially case reports, rather than randomized controlled trials, due to the small amount of scientific evidence in the literature.

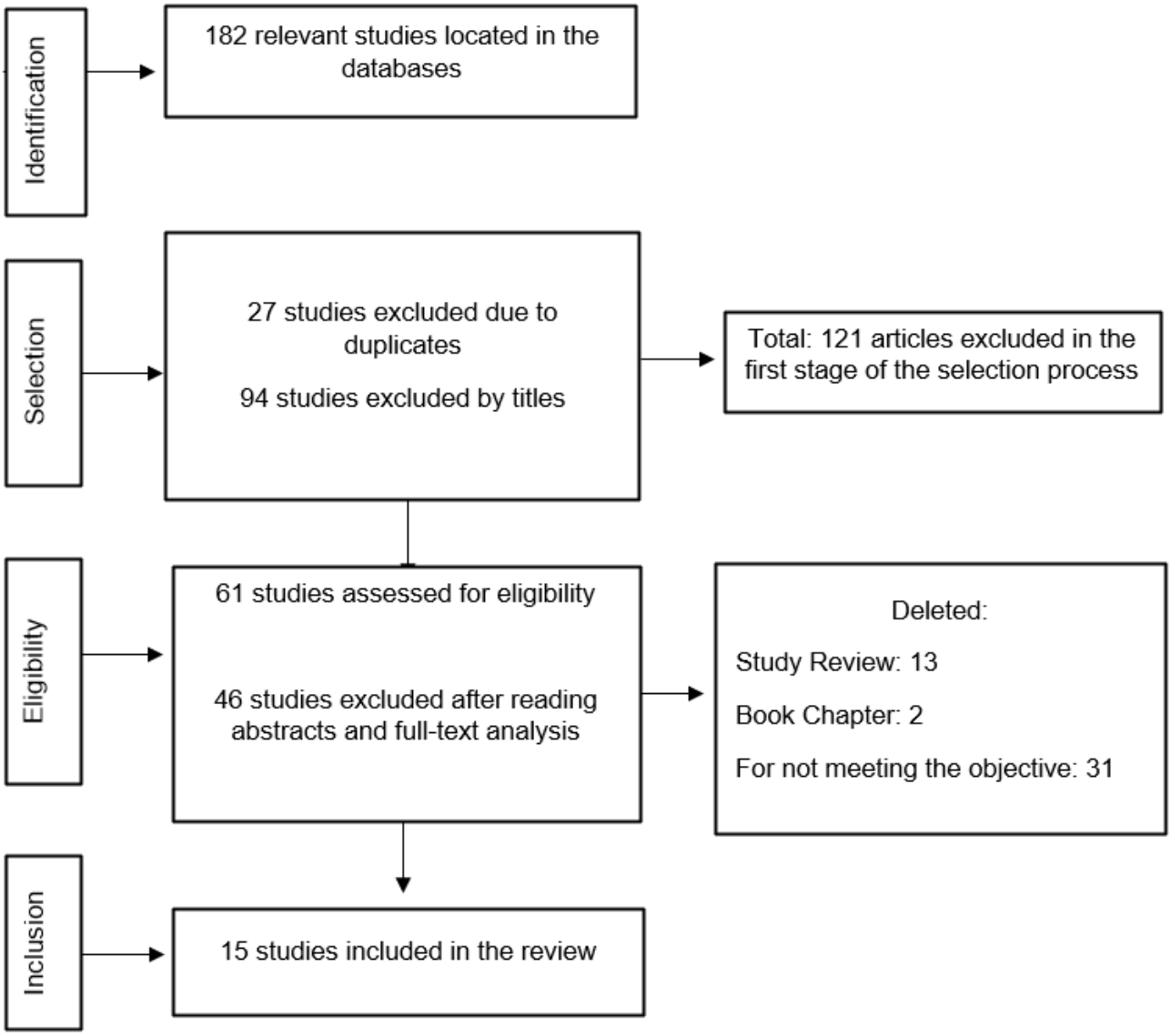
2.5 DATA ANALYSIS METHOD

Data were extracted from the selected studies, including information on the author, year of publication, study design, number and characteristics of participants, age, definitions of diagnostic methods and treatments used.

This systematic review was carried out according to the set of PRISMA recommendations (Preferred Reporting Items for Systematic Reviews and Meta-Analysis), described by Galvão et al. [13], shown in Figure 1.

A total of 182 full papers were screened and evaluated. Figure 1 shows a flowchart that summarizes the article selection process. After evaluating the titles and abstracts, 167 articles were excluded because they did not meet the eligibility criteria. In the end, only 15 studies met all the criteria and were included in this review.

Figure 1. Research Flowchart



Source: Author (2023).

The analysis of the results was performed in a descriptive manner, including a synthesis of each study present in the review and a synoptic table, which contains the following items: identification of the article, database in which the articles were found, journal of publication, and year of study.

3 RESULTS

Table 1 shows that 2022 had the highest number of publications selected for this research, with five articles (333.3%). The most frequent journals were Clin Pract Cases Emerg Med and Hand Surgery and Rehabilitation with two publications each, used in this study (13.3%, respectively). Most of the selected articles were found in PUBMED (73.3%). And there was a higher prevalence of case report studies (80.0%).

Table 1: Indexing characteristics of the studies used

Author/ Year	Type of Study	Newspaper	Database
Mohn et al. 2022	Retrospective Descriptive Study	Biology (Basel)	PUBMED
Boudon et al. 2022	Case Report	J Med Case Rep	PUBMED
Osipchuk et al. 2023	Case Report	Clin Pract Cases Emerg Med	PUBMED
Nakamuara et al. 2023	Case Report	BMC Pediatr	PUBMED
Fortney et al. 2022	Case Report	J Ultrasound	PUBMED
Tenazinha et al. 2022	Case Report	ARP Rheumatol	PUBMED
Nimjareansuk; Rosselli, 2020	Case Report	Clin Pract Cases Emerg Med	PUBMED
Prunières et al. 2018	Prospective Study	Hand Surgery and Rehabilitation	PUBMED
Jardin et al. 2018	Prospective Study	Hand Surgery and Rehabilitation	SCIENCE DIRECT
Schroeder et al. 2020	Case Report	Current Sports Medicine Reports	PUBMED
Bhagat; Scheels, 2023	Case Report	Visual Journal of Emergency Medicine	SCIENCE DIRECT
Sexton et al. 2019	Case Report	The Journal of Emergency Medicine	SCIENCE DIRECT
Yates et al. 2020	Case Report	Oxford Medical Case Reports	PUBMED
Neill et al. 2022	Case Report	Emergency Medicine Journal	PUBMED
Suwannaphisit; Ranong, 2020	Case Report	Annals of Medicine and Surgery	SCIENCE DIRECT

Source: Author (2023)

Chart 1 shows the authorship, year of publication, characterization of the sample, methods used in the diagnosis, and treatments recommended in the included studies.

Table 1. Clinical characteristics of studies eligible for this review. (n = 16)

Author/ Year	Sample	Diagnostic Method	Treatment Used
Mohn et al. 2022	▪ N: 65 ▪ Sex: Both sexes ▪ Age: 28 to 37 years old ▪ Diagnosis: Tenosynovitis of the finger flexors	▪ Clinical evaluation ▪ Ultrasound examination of pulleys, tendon sheaths, and tendons	Standard treatment: use of modeling clay and a compression finger stretcher made of silicone
Boudon et al. 2022	▪ N: 1 ▪ Gender: female ▪ Age: 65 years ▪ Diagnosis: Persistent tenosynovitis of the flexor tendons of the fingers of the right hand	▪ Clinical history ▪ Ultrasound ▪ Mri ▪ Biopsy	Combination of antimicrobial and immunosuppressive treatment
Osipchuk et al. 2023	▪ N: 1 ▪ Gender: female ▪ Age: 52 years ▪ Diagnosis: Tenosynovitis of the extensor	▪ Laboratory tests ▪ Radiographs ▪ Ultrasound ▪ Computed tomography	Surgical Debridement and Antibiotic Therapy
Nakamuara et al. 2023	▪ N: 1 ▪ Gender: Male ▪ Age: 7 years ▪ Diagnosis: Pyogenic flexor tenosynovitis	▪ Clinical anamnesis ▪ Laboratory tests ▪ Ultrasound	Antibiotic therapy

Fortney et al. 2022	▪ N: 1 ▪ Gender: Male ▪ Age: 9 months ▪ Diagnosis: Pyogenic flexor tenosynovitis	▪ Clinical anamnesis ▪ Laboratory tests ▪ Ultrasound	Surgical debridement and antibiotic therapy
Tenazinha et al. 2022	▪ N: 1 ▪ Gender: female ▪ Age: 72 years ▪ Diagnosis: Bilateral Candida tenosynovitis	▪ Clinical anamnesis ▪ Laboratory tests ▪ Ultrasound	Antifungal treatment
Nimjareansu; Rosselli, 2020	▪ N: 1 ▪ Gender: Male ▪ Age: 23 years ▪ Diagnosis: Pyogenic flexor tenosynovitis	▪ Clinical examination ▪ Laboratory tests ▪ Ultrasound	Antibiotic therapy, incision and drainage treatment
Prunières et al. 2018	▪ N: 20 ▪ Sex: Both sexes ▪ Age: 27 - 62 years ▪ Diagnosis: Pyogenic flexor tenosynovitis	▪ Clinical examination ▪ Laboratory tests ▪ Ultrasound	Debridement and antibiotic therapy
Jardin et al. 2018	▪ N: 57 ▪ Sex: Both sexes ▪ Age: 16 – 87 years ▪ Diagnosis: Pyogenic flexor tenosynovitis	▪ Clinical examination ▪ Laboratory tests ▪ Ultrasound ▪ Radiographs	Antibiotic therapy and surgical debridement
Schroeder et al. 2020	▪ N: 1 ▪ Gender: Male ▪ Age: 32 years ▪ Diagnosis: Pyogenic flexor tenosynovitis	▪ Clinical examination ▪ Laboratory tests ▪ Ultrasound ▪ Radiographs	Antibiotic therapy
Bhagat; Scheels, 2023	▪ N: 1 ▪ Gender: Male ▪ Age: 38 years ▪ Diagnosis: Pyogenic flexor tenosynovitis	▪ Clinical examination ▪ Laboratory tests ▪ Ultrasound ▪ Radiographs	Antibiotic therapy
Sexton et al. 2019	▪ N: 1 ▪ Gender: Male ▪ Age: 59 years ▪ Diagnosis: Tenosynovitis of the flexors	▪ Clinical examination ▪ Laboratory tests ▪ Ultrasound	Antibiotic therapy
Yates et al. 2020	▪ N: 1 ▪ Gender: Male ▪ Age: 66 years ▪ Diagnosis: Pyogenic flexor tenosynovitis	▪ Clinical examination ▪ Laboratory tests ▪ Ultrasound ▪ Radiographs	Drainage and Debridement and Antibiotic Therapy
Neill et al. 2022	▪ N: 1 ▪ Gender: Male ▪ Age: 49 years ▪ Diagnosis: Purulent flexor tenosynovitis	▪ Clinical examination ▪ Laboratory tests ▪ Ultrasound ▪ Radiography	Debridation and Antibiotic Therapy
Suwannaphisit; Ranong, 2020	▪ N: 1 ▪ Gender: female ▪ Age: 83 years ▪ Diagnosis: Tuberculous tenosynovitis	▪ Clinical examination ▪ Laboratory tests ▪ Ultrasound ▪ Radiography ▪ Biopsy	Debridation and Antibiotic Therapy

Source: Author (2023)

According to the data in Chart 1, it is possible to verify that patients affected by infectious tenosynovitis are usually male (53.3%), since there was a higher prevalence of males. They are usually over 30 years old (80.0%), and may also affect children (20.0%).

Chart 1 also shows that most individuals were diagnosed with pyogenic flexor tenosynovitis (53.3%). All studies used ultrasound as one of the diagnostic methods (100.0%). In addition, among the treatments used, there was a higher prevalence of antibiotic therapy (86.6%) and surgical debridement (40.0%).

4 DISCUSSION

According to Fortney et al. [15]) pyogenic flexor tenosynovitis (PFT) is a clinical diagnosis, imaging can be an informative complement, and ultrasonography (US) can be used in the early diagnosis of pyogenic flexor tenosynovitis because of its high sensitivity and negative predictive value.

From this perspective, the present systematic review sought to analyze the literature on the use of ultrasound in the diagnostic approach and therapeutic follow-up in patients with infectious tenosynovitis of the hand.

In this sense, Boudon et al. [16] found that ultrasound images were useful for identifying the inflammatory process of the metacarpophalangeal joints of the right hand. Similarly, in the report by Fortney et al. [15], ultrasound evaluation of the index finger was performed which demonstrated a collection of fluid within the flexor tendon sheath extending from the metacarpophalangeal joint to the distal phalanx with an additional fluid collection around the extensor tendon over the proximal phalanx, and no foreign bodies were identified. Fortney et al. [15] also emphasize that US was very useful in the diagnosis of PFT, while at the same time it excluded the presence of a retained radiolucent foreign body.

Corroborating these findings, Prunières et al.[3] found in their study that the mean diameter of the digital sheath measured in transverse and longitudinal ultrasound sections near the A2 pulley was 5.01 mm in symptomatic tenosynovitis fingers and 4.17 mm in healthy contralateral fingers. This difference of 17.8% was significant (p= 0.0005). Therefore, this unilateral increase of at least 20% in the diameter of the flexor sheath measured in transverse or longitudinal ultrasound sections on the A2 pulley contributed to the surgical indication of pyogenic flexor tenosynovitis.

In the report by Nakamuara et al. [17] US showed that the left PLF tendon had ruptured. In the research by Mohn et al. [6] An ultrasonographic examination of the pulleys, tendon sheaths, and tendons was performed in a transverse plane, which identified that the lesion occurred exclusively in the middle or ring finger (58.5% and 55.4%, respectively), except in one case in which the fifth finger was affected.

On the other hand, in the report by Suwannaphisit and Ranong [18], ultrasonography indicated chronic tenosynovitis of the flexor tendons of the fingers, with fluid more localized in the distal portion of the forearm and little finger. In addition, Tenazinha et al. Stuart et al.[19] reported that, on the initial evaluation, the presence of flexor tenosynovitis of the 3rd finger of the right hand and the 1st to 4th finger of the left hand and the left common flexor tendon leaf caused by Candida *albicans infection was observed*. According to the authors, *Candida albicans* is a rare cause of infectious tenosynovitis.

And according to Nakamuara et al. [17] In addition to blood culture, ultrasound evaluation should be performed in neonates with erythematous and swollen joints in order to identify the focus of infection as soon as possible. In addition, regular repeated US examination is important in the follow-up of bone and soft tissue infections.

In the study by Nimjareansuk and Rosselli [20], the use of point-of-care *ultrasound* (POCUS) was performed to aid in the diagnosis of pyogenic flexor tenosynovitis. And according to the authors, point-of-care ultrasound (POCUS) may be an effective adjunct in revealing pyogenic flexor tenosynovitis, rather than relying solely on the classic signs of Kanavel, leading to early treatment.

In this sense, Osipchuk et al. [21]) emphasize that point-of-care ultrasonography (POCUS) can be used to aid in the diagnosis of extensor tenosynovitis. And in his case report, the patient's physical examination findings were nonspecific, and the laboratory findings, along with the POCUS results, were instrumental in making the diagnosis.

In the study by Yates et al. [22], a POCUS was performed using a high-frequency linear array transducer in a Zonare ultrasound system, which demonstrated a large collection of complex fluid around the flexor tendons of the middle of the left forearm, extending to the volar aspect of the left hand. In this case, POCUS played an important role in the diagnosis of PFT in a patient with minimal physical examination findings, speeding up the initiation of appropriate therapy and surgical intervention.

In the research by Neill et al. [23] Ultrasound performed at the emergency room showed edema around the flexor pollicis longus tendon, demonstrated by a collection of hypoechoic fluid around the tendon sheath, referring to PFT. Based on this ultrasound, intravenous antibiotics were administered and the hand surgery service was consulted for surgical management and hospitalization. For this reason, Nimjareansuk and Rosselli [20] emphasize that performing a POCUS in the emergency department is an effective and timely adjuvant to support the diagnosis of pyogenic flexor tenosynovitis, leading to early treatment with antibiotics and/or surgical intervention.

Similarly, Schroeder et al. [24] also reported that POCUS performed on the patient's finger was indicative of soft tissue edema, peritendinous fluid, and calcification consistent with cellulitis. The patient was subsequently diagnosed with pyogenic flexor tenosynovitis because of his hot and painful edematous finger and the ultrasound findings were consistent with a soft tissue infection.

The ultrasonographic findings of the patient by Schroeder et al. [24] were consistent with the findings of the study by Jardin et al.[14] This study confirmed pyogenic flexor tenosynovitis. In the study by Jardin et al. [14] The results of US were compared to the intraoperative findings or to the clinical outcome in non-operated patients. In the 57 US examinations performed, significant peritendinous effusion was found in 27 patients (47.4%) and thickening of the synovial sheath with Doppler hyperemia in 23 patients (40.4%).

According to Prunières et al. [3] In the diagnosis of pyogenic tenosynovitis, ultrasonography has been shown to be more sensitive than clinical examination alone for detecting tenosynovitis. Ultrasound is easily accessible and does not delay patient care. The sensitivity of ultrasound has been shown to be superior to that of the clinical presentation in the diagnosis of flexor tenosynovitis during rheumatoid arthritis. Additionally, ultrasound can be helpful in monitoring progression after surgery and ensuring that the joint is not infected.

Jardin et al.Stuart et al.[14] reported in 57 patients that ultrasonography has a sensitivity of 94.4%, a specificity of 74.4%, a positive predictive value of 63%, and a negative predictive value of 96.7%, using surgical exploration as a reference. Therefore, the greatest utility of ultrasonography is to rule out PFT. Similarly, Nakamuara et al. [18] emphasize that US is an essential test for the diagnosis of pyogenic tenosynovitis, with a sensitivity of 94% and a negative predictive value of 97%.

Therefore, according to Jardin et al.[14] Ultrasonography is useful as a diagnostic tool for the management of early PFT, because of its excellent negative predictive value and specificity. This objective examination complements the surgeon's subjective clinical examination.

Corroborating this finding, Bhagat and Scheels [25] point out that without their report, on-site ultrasonography with the finger in a water bath revealed soft tissue edema, fluid around the tendon and no foreign body. The authors point out that in this case, the use of ultrasonography helped in the decision-making process and in the management of the disease.

Furthermore, according to Sexton et al. [26], as demonstrated in her case, ultrasonography can aid in the early identification of soft tissues and tendon alterations in the flexor tendon mechanism, leading to the early initiation of antimicrobial therapy and surgical consultation.

It is noteworthy that the case report by Schroeder et al.[24] differs from all other studies in which ultrasonography was used only as a diagnostic device. The authors used US as the object of treatment monitoring, therefore, the use of ultrasound aided in the early diagnosis of PFT and allowed the nonoperative treatment of the patient, as well as serial monitoring over time. Follow-up ultrasound showed continued improvement with mild soft tissue edema and confirmed that the flexor tendons were moving freely.

Therefore, it is evident that the ability of ultrasonography to interpret the efficacy of antibiotic monotherapy makes it possible to treat the patient without surgical intervention or to obtain invasive

tissue culture for diagnosis. It is believed that serial monitoring with ultrasonography should be systematically studied. The use of ultrasound has its limitations, including access and ability to interpret findings. This can be overcome with resources, education, and training. It is believed that the usefulness of POCUS ultrasonography is just beginning to be perceived and further studies and guidance on its proper implementation are needed[24].

5 CONCLUSION

Through the analysis of the researches, it was possible to identify that the ultrasound exam is widely used in the diagnostic approach of patients with tenosynovitis, however, its use in therapeutic follow-up is still not frequent, although its importance has been evidenced.

In addition, it was found that patients affected by infectious tenosynovitis are usually male, over 30 years of age, and may also affect children. Most individuals were diagnosed with pyogenic flexor tenosynovitis. All studies used ultrasound as one of the diagnostic methods. Among the treatments used, there was a higher prevalence of antibiotic therapy and surgical debridement.

According to the analysis performed, we found that bedside ultrasonography is an important imaging modality and should be considered for use in patients with suspected pyogenic tenosynovitis, due to its speed and greater sensitivity, as it allows the patient to be treated without surgical intervention and helps in the choice of the best treatment.

REFERENCES

Rerucha, C. M., Ewing, J. T., Oppenlander, K. E., & Cowan, W. C. (2019). Acute Hand Infections. American family physician, 99(4), 228–236.

Malizos, K. N., Papadopoulou, Z. K., Ziogkou, A. N., Rigopoulos, N., Athanaselis, E. D., Varitimidis, S. E., & Dailiana, Z. C. (2020). Infections of Deep Hand and Wrist Compartments. Microorganisms, 8(6), 838. https://doi.org/10.3390/microorganisms8060838

Prunières G, Igeta Y, Hidalgo Díaz JJ, Gouzou S, Facca S, Xavier F, Liverneaux P. Ultrasound for the diagnosis of pyogenic flexor tenosynovitis. Hand Surg Rehabil. 2018 May 11:S2468-1229(18)30061-6. https://doi.org/10.1016/j.hansur.2018.03.002.

De Maeseneer M, Meng J, Marcelis S, Jager T, Provyn S, Shahabpour M: Ultrasound anatomy of the fingers: flexor and extensor system with emphasis on variations and anatomical detail. J Ultrason 2020; 20: e122–e128. https://doi.org/10.15557%2FJoU.2020.0020

Rosskopf AB, Martinoli C, Sconfienza LM, Gitto S, Taljanovic MS, Picasso R, Klauser A. Sonography of tendon pathology in the hand and wrist. J Ultrason. 2021 Nov 29;21(87):e306-e317. https://doi.org/10.15557/JoU.2021.0052.

Mohn, S., Spörri, J., Mauler, F., Kabelitz, M., & Schweizer, A. (2022). Nonoperative Treatment of Finger Flexor Tenosynovitis in Sport Climbers-A Retrospective Descriptive Study Based on a Clinical 10-Year Database. Biology, 11(6), 815. https://doi.org/10.3390/biology11060815

Sharma, K.; Mull, A.; Friedman, J.; Pan, D.; Poppler, L.; Fox, I.K.; Levin, L.S.; Moore, A.M. Development and validation of a prognostic, risk-adjusted scoring system for operative upper-extremity infections. J. Hand Surg. 2020, 45, 9–19. https://doi.org/10.1016/j.jhsa.2019.10.010

Chapman T, Ilyas AM. Pyogenic flexor tenosynovitis: evaluation and treatment strategies. J Hand Surg Am. 2019; 44(11):981-985. https://doi.org/10.1016/j.jhsa.2019.04.011

DiPasquale AM, Krauss EM, Simpson A, Mckee DE, Lalonde DH. Cases of early infectious flexor tenosynovitis treated non-surgically with antibiotics, immobilization, and elevation. Plast Surg (Oakv). 2017; 25(4):272-274. https://doi.org/10.1177/2292550317731765

Koshy JC, Bell B. Hand infections. J Hand Surg Am. 2019; 44(1):46-54. https://doi.org/10.1016/j.jhsa.2018.05.027

Boyer E, Igeta Y, Jiang S, Arianni M, Goldammer F, Prunières G, et al. Designing a minimally-invasive, ultrasound-guided, percutaneous flexor tendon sheath lavage technique: a cadaver study.Hand Surg Rehabil. 2019; 38(2):87-90. https://doi.org/10.1016/j.hansur.2018.12.001

Donato H, Donato M. Etapas na Condução de uma Revisão Sistemática. Acta Med Port. 2019;32(3), 227-235. https://doi.org/10.20344/amp.11923

Galvão, T. F., Tiguman, G. M. B., Onofre, R. S. (2022). A declaração PRISMA 2020 em português: recomendações atualizadas para o relato de revisões sistemáticas. Epidemiologia e Serviços de Saúde [online], 31(2), e2022364.

Jardin E, Delord M, Aubry S, Loisel F, Obert L. Usefulness of ultrasound for the diagnosis of pyogenic flexor tenosynovitis: A prospective single-center study of 57 cases. Hand Surgery and Rehabilitation. 2018; 37(2):95–98. https://doi.org/10.1016/j.hansur.2017.12.004

Fortney, T. A., Mead, K. C., Wright, T. E., Sin, J. M., & Warhold, L. G. (2022). Ultrasound diagnosis of pyogenic flexor tenosynovitis in a 9-month-old infant: a rare case report. Journal of ultrasound, 25(2), 365–368. https://doi.org/10.1007/s40477-021-00567-x

Boudon, A., Opota, O., & Dan, D. (2022). A refractory tenosynovitis of the wrist: a case report. Journal of medical case reports, 16(1), 75. https://doi.org/10.1186/s13256-022-03278-x

Nakamuara, T., Iwai, M., Inoue, T., Irie, H., Karasugi, T., Seki, A., Hamaguchi, M., Kuraoka, S., Mizukami, T., & Nakamura, K. (2023). A neonate with multiple hand flexor tendon ruptures due to methicillin-susceptible Staphylococcus aureus sepsis: a case report. BMC pediatrics, 23(1), 68. https://doi.org/10.1186/s12887-023-03871-z

Suwannaphisit S, Ranong NN. Tuberculous tenosynovitis of the Flexor Tendons of the hand and wrist: A case report and mini-review. Annals of Medicine and Surgery. 2020;57:249-252.https://doi.org/10.1016/j.amsu.2020.07.061

Tenazinha, C., Barros, R., & Romão, V. C. (2022). Candida albicans tenosynovitis of the hand. Candida albicans tenosynovitis of the hand. ARP rheumatology, 1(2), 183–184.

Nimjareansuk, W. S., & Rosselli, M. (2020). Pyogenic Flexor Tenosynovitis as a Rare Complication of Dyshidrotic Eczema. Clinical practice and cases in emergency medicine, *4*(2), 174–177. https://doi.org/10.5811/cpcem.2020.1.45414

Osipchuk, D., & Riddell, J. (2023). Bilateral Infectious Extensor Tenosynovitis: A Case Report. Clinical practice and cases in emergency medicine, 7(2), 73–76. https://doi.org/10.5811/cpcem.1317

Yates MC, Chiasson KF, Pacheco ZS, Gullett JP, Denney BD, Pigott DC. Point-of-care ultrasound diagnosis of flexor tenosynovitis caused by an unusual pathogen. Oxf Med Case Reports. 2020 Dec 28;2020(12):omaa115. https://doi.org/110.1093/omcr/omaa115.

Neill E, Anaya N, Graglia SPoint-of-care ultrasound for diagnosis of purulent flexor tenosynovitisEmergency Medicine Journal 2022;39:716-718. https://doi.org/10.1136/emermed-2020-211113

Schroeder, Paul B. MD 1 ; Hutto, Wesley M. MD 1 ; Leggit, Jeffery C. MD, CAQSM 2 ; Parker, Charles H. MD 3. Ultrasound Use and Outpatient Management for Pyogenic Flexor Tenosynovitis: A Case Report. Current Sports Medicine Reports 19(6):p 199-201, junho de 2020. https://doi.org/10.1249/JSR.0000000000000717

Bhagat G, Scheels W. POCUS evaluation of pyogenic flexor tenosynovitis. Visual Journal of Emergency Medicine. 2023;30(101584):1-2. https://doi.org/10.1016/j.visj.2022101584

Sexton J, Pittman M, Morrow D.Flexor Tenosynovitis Using Ultrasound. The Journal of Emergency Medicine. 2019; (5):560–561. https://doi.org/10.1016/j.jemermed.2019.01.028

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ABSTRACT

Ascariasis is an intestinal parasitic infection caused by Ascaris lumbricoides. Although it is found globally, this disease is more prevalent in developing countries, such as Brazil, due to the lack of infrastructure and basic sanitation. The deficiency in Public Health services in these regions favors the spread of the parasite, especially among the economically disadvantaged population living in precarious conditions, affecting mainly children. The objective of this study was to conduct a detailed review of the importance of health education in controlling and preventing ascariasis in childhood. Using an indirect approach, searches were carried out in various databases available on virtual platforms. The results pointed to insufficient knowledge among the majority of the Brazilian population regarding the modes of transmission and prevention of this disease, contributing to high prevalence rates of this parasitic infection. Therefore, it is believed that the dissemination of more comprehensive knowledge and information about ascariasis is key to preventing this illness. Health education emerges as a crucial strategy to instruct the population, especially parents and caregivers, on hygiene practices and preventive measures. Investing in educational programs targeted at vulnerable communities can play a fundamental role in reducing the spread of the parasite and promoting healthy habits, resulting in a significant impact on the prevention and control of ascariasis, especially among children.

Keywords: Parasitic Load, Ascariasis, Health education, Primary Prevention.

1 INTRODUCTION

Enteroparasitosis refers to infections caused by parasites, which fall into two categories: helminths or protozoa. This condition represents the most common ailment globally, affecting individuals in all stages of life, especially children during their school years, potentially impacting their physical and mental development. Its occurrence is widespread worldwide, identified not only in

Brazil but also in other developing nations, exhibiting a variety of manifestations depending on levels of basic sanitation, socioeconomic status, education levels, age groups, hygiene practices, as well as the specific climatic and environmental patterns of each geographic area[3].

The most prevalent infectious ailments are associated with enteroparasitic infections, affecting approximately 3.5 billion people worldwide. In Brazil, millions of inhabitants suffer from some form of parasitic infestation. Among these parasites, ascaridiasis stands out, a widely predominant helminthic infestation globally, caused by the nematode *Ascaris lumbricoides*, commonly known as roundworm. This condition causes the ailment called ascaridiasis or ascariasis, presenting symptoms such as nausea, vomiting, and a clinical picture that can worsen, resulting in malnutrition due to fluid loss caused by diarrhea, anemia, intestinal obstruction, and difficulties in nutrient absorption[6].

As of January 2022, the World Health Organization (WHO) estimated that over 1 billion people globally were susceptible to infection by this agent, revealing a significant global public health challenge. Another contributing factor to the increasing incidence of these parasitic infections is the negative impact resulting from the migration from rural to urban areas, a consequence of uncontrolled city growth. This phenomenon is exacerbated by environmental pollution that facilitates the spread of these diseases. Transmission occurs through contaminated water, soil, and food, finding favorable conditions to spread in areas lacking infrastructure and basic sanitation services, significantly affecting the populations in these regions, especially children. They are more susceptible to infection when playing in contaminated areas, leading to potentially having hands with parasite eggs directly in their mouths or handling toys and objects that may later come into contact with the mucous membranes of other children[5, 6].

Therefore, the spread of these parasites is more prevalent in environments such as daycares and educational institutions. The purpose of this article was to conduct a literature review on the relevance of health education in addressing *Ascaris lumbricoides* in Brazilian children. Additionally, it aimed to understand and explain the life cycle of this parasite, as well as its methods of transmission, to identify and comprehend the most effective strategies for preventing this infection[4]. The objective of this study was to conduct a detailed review of the importance of health education in controlling and preventing ascariasis in childhood.

2 MATERIALS AND METHODS

The methodology employed in this study is qualitative and descriptive, centered on a bibliographic search. It was conducted through consulting online databases such as Google Scholar, Scientific Electronic Library Online (SciELO), CAPES Portal, PubMed, and by reviewing books available at the University of Gurupi, Paraíso do Tocantins campus library. The search terms used

were: "parasitoses in children," "health education in Brazil," "childhood enteroparasitosis," and "ascariasis."

3 THEORETICAL FRAMEWORK

Education is a comprehensive learning process that empowers individuals holistically, enabling the development of their intellectual, physical, and moral faculties. Within this context, health education, also known as education for health, constitutes a process that provides essential information for preserving or improving health status, aiming to promote it. It is a vital element in health protection and recovery programs, intending to empower individuals in various contexts, allowing them to make informed decisions to achieve a more favorable personal, family, and collective health status [1].

When educational practices are adequately employed, they empower individuals to acquire knowledge for the prevention of parasitic infections, achieving established goals, and emphasizing the importance of educational guidance to raise awareness among the population. Thus, the citizen becomes a promoter of health, as their daily actions contribute to improving family well-being. It is valid to assert that many countries still maintain cultural and social aspects entrenched in the population regarding hygiene habits, which require changes [2].

4 CHILDHOOD PARASITISM

The contact between children carrying parasites and those more susceptible, whether in a domestic or school environment, along with their frequent practices involving soil manipulation and the habit of putting dirty hands in their mouths, are factors that increase the likelihood of infection in the age range of 1 to 12 years [7]. While adults generally do not show symptoms of certain parasitic diseases, possibly due to changes in hygiene habits or immunity developed during childhood, children remain highly susceptible to intestinal parasitic infections as they can come into contact with these pathogens from the first months of life. Due to the lack of established hygiene routines, children continue to be the most affected group, significantly increasing the risk of infections. According to the authors, daycare centers represent favorable environments for the spread of parasitic diseases due to the intense interaction among children and often the poor hygiene conditions, frequently resulting from inadequate staff training [10].

5 BASIC SANITATION AND INFRASTRUCTURE

The absence of basic sanitation services and infrastructure contributes to the spread of parasitic diseases. Therefore, poor living conditions, lack of knowledge among the population regarding the transmission and control of these infections, the importance of personal hygiene principles, and adequate food preparation practices are contributing factors to the increased occurrence of intestinal

infections caused by parasites. The presence of *Ascaris lumbricoides*, one of the main intestinal worms affecting human health, is deeply associated with socioeconomic factors such as poverty, lack of education, and deficiencies in basic sanitation [9]. This interrelation reveals a complex reality that impacts the health of millions of people worldwide, particularly in regions where these conditions are interconnected. Poverty is a determining factor in the spread of *Ascaris lumbricoides* infections. Economically disadvantaged communities often face poor housing conditions, lack of access to clean water, and adequate sanitation. The absence of basic sanitation infrastructure, such as water and sewage treatment systems, significantly increases the risk of contamination by these parasites. Contaminated water and lack of hygiene facilitate the transmission of these infections, especially among children[8].

Furthermore, lack of education plays a crucial role in the spread of ascariasis. The scarcity of knowledge about proper hygiene practices, the mode of transmission of these parasitic diseases, and the importance of preventive measures contribute to high infection rates. In areas with low levels of education, individuals may not be aware of behaviors and habits that reduce the risk of *Ascaris lumbricoides* infection, resulting in increased vulnerability to the disease. An integrated approach to combat *Ascaris lumbricoides* contamination should address these interconnected aspects. Investments in health education programs, promotion of proper hygiene, and improvement in sanitation are essential to reduce the prevalence of these infections[14]. It is imperative that steps be taken to ensure equitable access to clean water, basic sanitation, and health education for socioeconomically vulnerable communities, as this is the only way to effectively address the challenge of ascariasis and other parasitic diseases that significantly impact the quality of life of the most disadvantaged populations. As observed in Table 01.

Table 01 - Saneamento Brazil Panel

Saneamento Brazil Panel					
Year	Block	Indicator	Value	Unit	Fonte
2021	Sanitation operations	Population without access to water	33.211.937	people	SNIS
2021	Sanitation operations	Proportion of the population without access to water	15,8%	% of the population	SNIS
2021	Sanitation operations	Population without sewage collection	92.871.315	people	SNIS
2021	Sanitation operations	Proportion of the population without sewage collection	44,2%	% of the population	SNIS
2021	Sanitation operations	Index of treated sewage referred to consumed water	51,2%	%	SNIS
2021	Sanitation operations	Untreated sewage	5.221.572,64	mil m³	SNIS
2021	Sanitation operations	Distribution losses	40,3%	%	SNIS
2021	Health	Total hospitalizations due to waterborne diseases	128.912	Number of hospitalizations	DATASUS
2021	Health	Incidence of total hospitalizations due to waterborne diseases	6,04	Hospitalizations per 10 thousand inhabitants	DATASUS
2021	Health	Total hospitalizations - 0 to 4 years old	45.359	Number of hospitalizations	DATASUS
2021	Health	Deaths due to waterborne diseases	1.493	Number of deaths	DATASUS
2021	Health	Expenses on hospitalizations due to waterborne diseases	54.791.900,15	R$	DATASUS
2021	Education	Education level of individuals with sanitation	9,18	Years of formal education	IBGE
2021	Education	Education level of individuals without sanitation	5,31	Years of formal education	IBGE
2021	Education	School delay among youth with sanitation	1,53	Years of educational delay	IBGE
2021	Education	School delay among youth without sanitation	2,35	Years of educational delay	IBGE
2021	Education	Average score on ENEM (Brazilian National High School Exam) - with bathroom	535,69	Points	INEP
2021	Education	Average score on ENEM - without bathroom	468,31	Points	INEP

Source: Brazil Sanitation Panel - www.painelsaneamento.org.br

The absence of basic sanitation is intrinsically related to the increased incidence of parasitic infections. In regions or communities where there is inadequate access to water treatment systems, proper waste disposal, and sanitary facilities, the spread of intestinal parasites such as *Ascaris lumbricoides* becomes more prevalent[11]. The lack of sanitation directly contributes to environmental contamination with pathogenic agents, turning water, soil, and food into potential sources of parasitic infection. In environments lacking sanitation, individuals, especially children, are more susceptible to coming into contact with these parasites, resulting in a continuous cycle of infection and spread of these diseases. Therefore, the lack of adequate sanitary conditions plays a significant role in the rise of parasitic infections, negatively impacting the health and well-being of communities[10].

6 ASCARIASIS

Ascariasis is a pathological condition caused by worms from the Ascarididae family, with the causative agent being *Ascaris lumbricoides*, a type of light-colored nematode commonly known as roundworm. These parasites are frequently mentioned due to their global distribution, found throughout the world and more prevalent in regions with warm climates and deficient basic sanitation infrastructure. Although they can affect individuals of any age, they are more common in children between the ages of 2 and 10 [12].

An individual infected by the worm daily excretes thousands of parasite eggs through feces. In areas lacking proper basic sanitation systems, these feces contaminate soil and water. This process facilitates the transmission of *Ascaris lumbricoides*: a healthy person can inadvertently be

contaminated by ingesting these eggs present in the environment. Usually, children contract the infection through direct contact with the soil while playing, while adults tend to become infected by ingesting contaminated water or food. The eggs of these worms are highly resistant, remaining viable for several years when they find suitable conditions of humidity and temperature in the environment [15].

Filtering water, cooking food, and properly sanitizing raw fruits and vegetables are sufficient measures to eliminate the eggs and prevent the contamination of new individuals. Previous infection by A. lumbricoides does not provide immunity, and it is possible for the same person to develop the parasitosis several times throughout life. In ascariasis, the infestation is considered of low intensity when the number of parasites ranges from three to four worms, usually without symptoms. Adult worms can cause espoliative, toxic, or mechanical effects in medium intensity infestations, which have between 30 to 40 worms, or in massive infestations, with a quantity equal to or greater than 100 worms 1.

In these infections, the absorption of certain essential nutrients such as proteins, vitamins, lipids, and carbohydrates is frequent. In Loeffler's syndrome, a more severe lung condition, there is edema in the lung alveoli, along with a tissue infiltrate rich in eosinophils, triggering allergic manifestations and a clinical-radiological picture similar to pneumonia. One of the most prevalent complications is intestinal obstruction due to the parasites' coiling in the intestinal lumen [13].

7 FINAL CONSIDERATIONS

In light of the foregoing, it becomes crucial to emphasize the importance of sanitation practices to educate the population, especially children, who are more susceptible to infections due to their increased vulnerability. They often have direct or indirect contact with places or objects that may be contaminated and often lack adequate instruction regarding basic hygiene principles. Therefore, the implementation of sanitary education in the population's daily life becomes essential, as it is the main strategy to combat this parasite. Transmission mainly occurs through contact with contaminated soil, water, and food, hence investing in sanitary education is a crucial way to enhance and preserve individuals' health, effectively promoting it.

REFERENCES

Andrade EC, et al. Parasitoses Intestinais: Uma revisão sobre seus aspectos sociais, epidemiológicos, clínicos e terapêuticos. Rev APS. 2010;13(2):231-240.

Borja PC. Política Pública de Saneamento Básico: uma análise da recente experiência brasileira. Saúde Soc. 2014;23(2):432-447.

Gross AA, Silva GK. Incidência de enteroparasitoses intestinais em uma escola infantil pública e uma escola comunitária, em um município do interior do Rio Grande do Sul. Rev Destaques Acadêmicos. 2016;8(3):50-57.

Hiller L. Panorama do Saneamento Básico no Brasil: Elementos conceituais para o saneamento básico. V.1. Brasilia: Ministério das Cidades, 2011.

Hotez PJ, et al. Helminth infections: the great neglected tropical diseases. J Clin Invest. 2008;188(4):1311-1321.

Jesus L, Raposo R, Guazelli A. Acaridíase biliar complicada: espectro de problemas e táticas cirúrgicas. Rev Col Bras Cir. 2018;31(3).

Nascimento YM. Estudo acerca da ocorrência de helmintos intestinais em dois municípios do estado da Paraíba. [TCC em Bacharel]. Universidade Federal da Paraíba. 2014. Disponível em: http://rei.biblioteca.ufpb.br/jspui/bitstream/123456789/622/1/YMN22072014.pdf.

Neves DP, et al. Parasitologia humana. 12.ed. São Paulo: Editora Atheneu, 2011.

Nunes VRS. O Setor de Saneamento Básico no Brasil: desafios e perspectivas. [Dissertação de Graduação]. Universidade Federal do Rio de Janeiro. 2015. Disponível em: http://monografias.poli.ufrj.br/monografias/monopoli10014809.pdf.

Oliveira JLL. Parasitoses Intestinais: O ensino como ferramenta principal na minimização destas patologias. [Dissertação de Mestrado]. Centro Universitário Volta Redonda-UNIFOA. 2013. Disponível em: http://web.unifoa.edu.br/portal_ensino/mestrado/mecsma/arquivos/2013/19.pdf.

Ribeiro JW, Rooke JMS. Saneamento Básico e sua Relação com o Meio Ambiente e a Saúde Pública. [Dissertação de Especialização]. Universidade Federal de Juiz de Fora-UFJF. 2010. Disponível em: http://www.ufjf.br/analiseambiental/files/2009/11/TCCSaneamentoeSa%C3%BAde.pdf.

Rubinger SD. Desvendando o conceito de Saneamento no Brasil: Uma analise a percepção da população e do discurso técnico contemporâneo. [Dissertação de Mestrado]. Universidade Federal de Minas Gerais-UFMG. 2008. Disponível em: http://www.bibliotecadigital.ufmg.br/dspace/bitstream/handle/1843/ENGD7HAK2H/528m.pdf?sequence=1.

Silva JC, et al. Parasitismo por Ascaris lumbricoides e seus aspectos epidemiológicos em crianças do Estado do Maranhão. Rev Soc Bras Med Trop. 2011;44(1):100-102.

Soares AL, Neves EA, Souza IFAC. A importância da educação sanitária no controle e prevenção ao Ascaris lumbricoides na infância. Portal periódicos grupo Tiradentes. 2018;3(3).

Souza GBF, et al. Infestação Maciça por Ascaris lumbricoides: Relato de caso. Biota Amazônia. 2014;4(4):101-106.

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