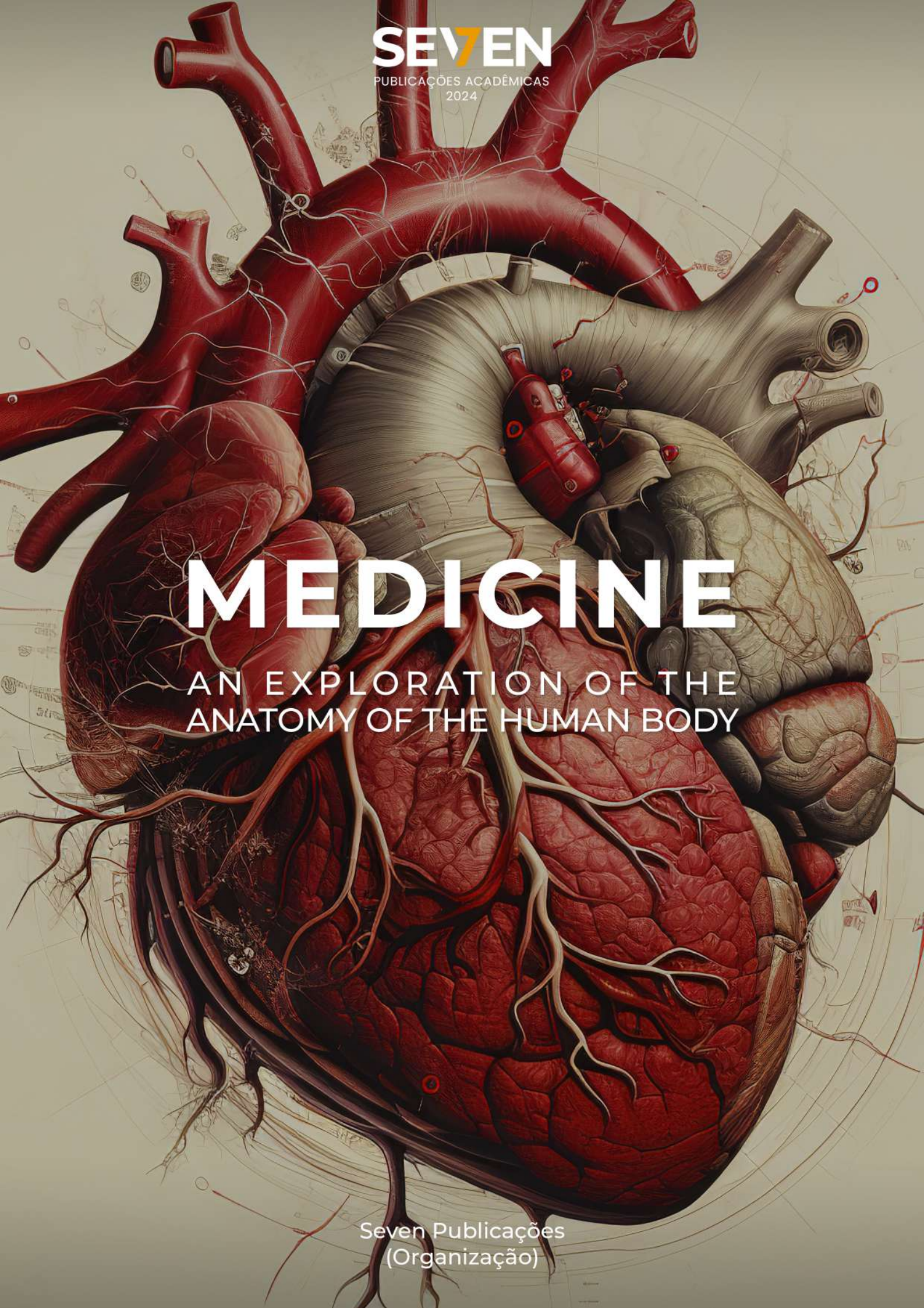
SEVEN
PUBLICAÇÕES ACADÊMICAS
2024

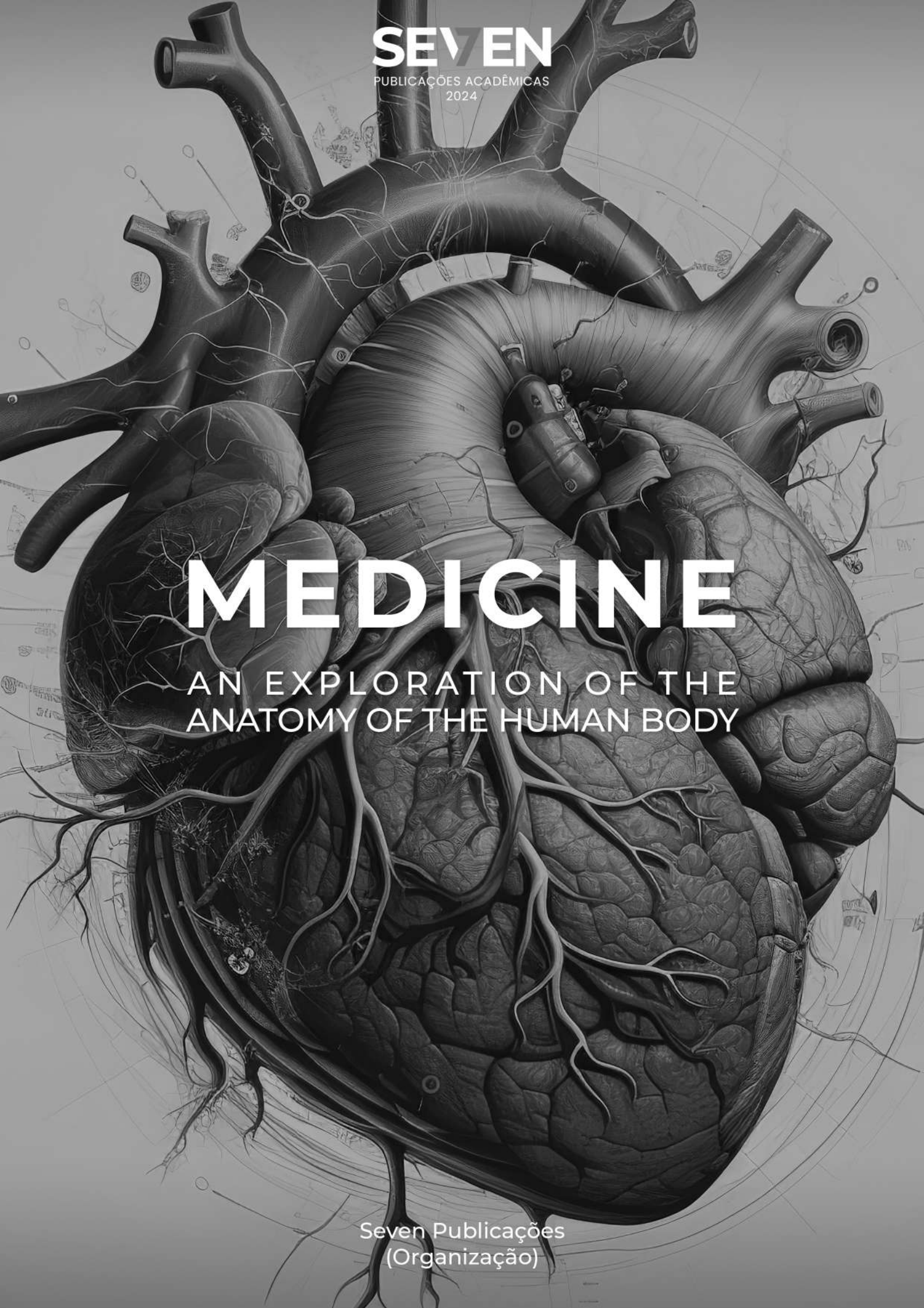


MEDICINE

AN EXPLORATION OF THE ANATOMY OF THE HUMAN BODY

Seven Publicações
(Organização)

SEVEN
PUBLICAÇÕES ACADÊMICAS
2024



MEDICINE

AN EXPLORATION OF THE ANATOMY OF THE HUMAN BODY

Seven Publicações
(Organização)

EDITOR-IN-CHIEF
Profº Me. Isabele de Souza Carvalho

EXECUTIVE EDITOR
Nathan Albano Valente

BOOK ORGANIZER
Seven Publications LTDA

EDITORIAL PRODUCTION
Seven Publications Ltda

TEXT EDITING
Stefanie Vitoria Garcia de Bastos

ART EDIT
Alan Ferreira de Moraes

COVER IMAGES
AdobeStok

LIBRARIAN
Bruna Heller

AREA OF KNOWLEDGE
Health Sciences

SEVEN
PUBLICAÇÕES ACADÊMICAS

International Cataloguing in Publication Data (CIP) (Brazilian Book Chamber, SP, Brazil)

M489

Medicine : an exploration of the anatomy of the human body [electronic resource] / Seven Editora. – São José dos Pinhais, PR: Seven Editora, 2024.
Electronic data (1 PDF).

ISBN 978-65-85932-05-9

1. Health. 2. anatomy. 3. Health sciences. I. Title.

CDU 611

Indexes for systematic catalogue:

Cataloguing at source: Bruna Heller (CRB10/2348)

1. CDU: Health sciences: anatomy 611

Seven Publications Ltda
CNPJ: 43.789.355/0001-14
editora@sevenevents.com.br
São José dos Pinhais/PR

SEVEN
PUBLICAÇÕES ACADÊMICAS

AUTHOR'S STATEMENT

The author of this work DECLARES, for the following purposes, that:

You do not have any commercial interest that creates a conflict of interest in relation to the content
published;

Declares to have actively participated in the construction of the respective manuscripts, preferably under the following conditions: "a) Study design, and/or data acquisition, and/or data analysis and interpretation; b) Preparation of the article or review to make the material intellectually relevant; c) Final approval of the manuscript for submission";

Certifies that the published text is completely free of fraudulent data and/or results and authorship defects;

Confirms the correct citation and reference of all data and interpretations of data from others Research;

Acknowledges that it has informed all sources of funding received to carry out the research;
Authorizes the editing of the work, including catalog registrations, ISBN, DOI and other indexers, visual design and cover creation, internal layout, as well as its release and dissemination according to the criteria of Seven Academics Events and Publishing Company.

PUBLISHER'S STATEMENT

Seven Publications DECLARES, for the purposes of rights, duties and any methodological or legal meanings, that:

This publication constitutes only a temporary transfer of copyright, constituting a right to publication and reproduction of the materials. The Publisher is not co-responsible for the creation of published manuscripts, under the terms established in the Copyright Law (Law 9610/98), in article 184 of the Penal Code and in article 927 of the Civil Code; The author(s) is solely responsible for verifying such copyright and other issues, holding the Publisher harmless from any civil, administrative, and criminal damages that may arise.

Authorizes the DISSEMINATION OF THE WORK by the author(s) in lectures, courses, events, concerts, media and television, provided that there is due recognition of the authorship and editing and without any commercial purpose, with the presentation of the due CREDITS to SEVEN PUBLICATIONS, being the author(s) and publisher(s) responsible for the omission/exclusion of this information;

All ebooks are open access, so don't sell them on your website, partner sites, e-commerce platforms, or any other virtual or physical medium. Therefore, it is exempt from copyright transfers to authors, since the format does not generate other rights beyond the didactic and advertising purposes of the work, which can be consulted at any time.

All members of the editorial board have doctors and are linked to public institutions of higher education, as recommended by CAPES to obtain the Qualis book;
Seven Academic Events does not assign, sell, or authorize the use of the names and e-mails of the authors, as well as any other data of theirs, for any purpose other than the dissemination of this work, in accordance with the Civil Rights Framework for the Internet, the General Data Protection Law and the Constitution of the Federative Republic.

AUTHORS

Akidauanna Sales Bezerra Soares
Alana Freire Cisne
Alesson Miranda Farias
Alexandre Martins Portelinha Neto
Alice Rodrigues Ramos
Aline Neves Viana
Allan Maia de Jesus
Amanda Castro Barroso Pinheiro
Ana Carolina Câmara Reis
Ana Carolina Fermino
Ana Fernanda Frazão Silva
Ana Maria Gaboni de Oliveira
Ana Patricia Lima Rocha Fonseca
Ana Paula Costa Linhares
Ana Yasmin Tomás Ananias
André Luiz Cardoso Gomes
André Mio Takayama
Angélica Augusta Grigoli Dominato
Antônia Rejânia Ávila
Antônio Gabriel Prazeres Araújo
Arkila Pinheiro Rodrigues de Sousa
Astor Castro Barbosa Neto
Augusto Hipólito Chagas Freato
Bárbara Barreira Carvalho
Barbara Cristina Rodrigues Neres
Barbara Vilanova Bezerra
Barbara Yanaisa Castellanos Rodriguez
Beatriz Furtado Ferro
Bethânia Flach Antunes
Bianka Nayê Istécia de Oliveira
Bruna dos Santos Durães de Paula
Bruna Drebes
Bruna Gidiel Paim
Bruna Guedes Neves
Bruna Martins Garlet
Camila Coelho Chaves Gaspar
Carlos Augusto Portela
Carlos Eduardo da Silva Sousa
Carlos Walmyr de Mattos Oliveira
Carolina Amadeu Fecchio
Clarissa Ferreira Pontual de Oliveira
Clarissa Oliveira Lopes
Claudia Elizabeht Guerrero
Claudia Regina de Freitas
Cremilde Aparecida Trindade Radovanovic
Cristian Rocha Hidalgo
Daniel Souza e Silva Duarte
Davi Veloso Lima de Paula Sousa
David Sandro Araújo
Débora Sousa Paiva
Denis Kleber Holanda Guerra
Diego Bruno Santos Pinheiro
Eduardo Camelo de Castro
Eduardo Vichnevski Frota
Elimeire Alves de Oliveira
Elisangela Maria Nicolete Rampazzio
Erika Mourão Alves Silva
Fernanda Maria Gonçalves
Fernanda Moraes de Abreu
Fernanda Pereira da Silva
Fernanda Pereira dos Santos
Fernando Duarte Cassel
Fernando Paiva
Filipe Bochensky Siqueira
Flávio Gifoni Siebra de Holanda
Flávio Roberto Gravetz
Francihellen Dantas Rego Guida
Francisco do Nascimento Moura Neto
Francisco Edson das Chagas Silva
Francisco Roldineli Varela Marques
Gabriella Reis de Barros Ribeiro
Gerardo Maria de Araújo Filho
Giovana Sousa Ribeiro
Gislaine F. F. Garcia
Guilherme Marroques Noleto
Gustavo Borges Castanheira
Gustavo Tinarelli Lessi
Hiasmin Batista Rodrigues
Ianne Lima Xavier de Almeida
Irene de Lourdes Noronha
Isabela Malerba Pinheiro
Isabela Maria Mesquita Moreira
Isabella Morelli Lopes Gratão
Isabelle Oliveira Maceda
Isadora Cardoso Alves Propercio
Ivi Ribeiro Back
Jady Braga Fernandes
Jessica Thaísa Lopes Soares
João Pedro Kremer Ferraz
João Victor Maia Piauilino
João Victor Marinho Pereira
Joelma Santos Pereira Castilho
José Kleber de Figueiredo
José Manuel Condor Capcha
José Walter Lima Prado
Josimar Cunha Rodrigues Junior
Júlia Fernanda Ferreira do Nascimento
Júlia Gabriela da Silva Goiabeira
Kaline dos Santos Kishishita Castro
Karina Pereira Gomes
Karine Queiroz Poletto
Karna Mireya Braga Cipriano Gomes
Kauany Sousa Aguiar
Lais Akemi Shiraishi
Lara Gonçalves de Sousa Liso
Lara Rodrigues Saunders de Castro

Larissa de Queiroz Gomes
Larissa Gonçalves Barbosa
Leidiane Maria da Silva de Paiva
Leonel Carmo Rodrigues
Liliane Sousa Borges Pinheiro
Lívia de Freitas Mendonça Gontijo
Lorena Menegussi Machado
Luana Cristina Bellini Cardoso
Lucas Benedito Fogaça Rabito
Lucas Pereira Figueiredo
Lúcia da Conceição Andrade
Luciane Schadeck
Ludmila Mendes Ferreira
Luís Carlos de Paula e Silva
Magno Fernando Almeida Nazaré
Marcelly Kelmanny da Luz Sampaio
Marcia Figueira Canavez
Marcia Maria Bastos da Silva
Marcilene de Amorim Sandes
Marcio Alberto Pinto Nunes Junior
Márcio Hideki Setogutti Nanamura
Marcos André de Souza
Marcos Antonio da Silva
Marcos Paulo Costa Vilela
Maressa Victória Rodrigues de Paula
Margoth Ramos Garnica
Maria Alexandra de Carvalho Meireles
Maria Beatriz Mendes de Sousa
Maria Clara Barbosa Celestino
Maria Clara Pereira Nogueira da Cruz
Maria Claudia Costa Irigoyen
Maria de Lourdes Santos Rocha
Maria Deluza Alves da Silva
Maria Fernanda Almeida do Vale
Maria Helena Milones da Silva
Mariana Rodrigues da Silva de Menezes
Mariane Amado de Paula
Marilea dos Santos Carvalho
Marine Praciano Costa
Marlon Cantillo da Luz
Matheus Brandão Guimarães Santos
Matheus Custódio Vieira Braga
Mauricio Simon Paiva
Mayumi Honda Pereira
Mylena Andréa Oliveira Torres
Natália Maria Figueiredo Campos
Natan Fontoura Saratt da Silva
Natanael Cazuza Sales da Silva
Nicole Bento de Castro
Nicole Falone Resende Honorato
Odete Alves Palmeira
Paula da Silva Fernandes
Paulo Sampaio Gutierrez
Pedro Guilherme Coutinho Ribeiro
Pedro Henrique Pereira da Silva Alves
Pedro Henrique Pinheiro Dantas
Priscila Dias Pinto
Rafael Manfro
Rafaela Rodrigues de Sousa Gonçalves
Ramon Henrique Avanci
Randyston Brenno Feitosa
Raphaela Abreu Everton
Rebeca da Silveira Ferreira
Rebecca Padilha Santos
Renata Ferreira Sousa
Renata Martins da Silva Pereira
Roberta Tognollo Borotta Uema
Roberto Araújo de Oliveira Filho
Roberto de Souza Moreira
Rodrigo Padilla
Rogério Fett Schneider
Rolando Gutierrez Rosales
Sabrina Stefany Peres
Samara Ferreira Costa
Sâmia Quirino da Silva
Sileno Marcos Araujo Ortin
Solange Mendes Vieira
Soraya Batista de Moraes
Talita Rojas Cunha Sanches
Teddy Talbot
Thaiz Brandão Cosac
Thamires Fernandes Cardoso da Silva Rodrigues
Tiago Augusto Comino da Silva
Tiago Bittencourt de Oliveira
Tiago Moreno Lopes Roberto
Umberto Pereira Souza Júnior
Vilton Zimmermann de Souza
Vinícius de Medeiros Moreira
Vinícius Fabris
Virgínia Leonardi Dambros
Vitória de Castro Novais
Viviane Sousa Borges Lima
Wellington Costa Tomaz
Yarla Guerra Saldanha
Yasmim Priscilla Gomes de Jesus

SUMMARY

Duplicity of the circumflex artery, a coronary anomaly: Case report

https://doi.org/10.56238/sevened2024.005-001

Maria Clara Barbosa Celestino[1], Lais Akemi Shiraishi[2], Alexandre Martins Portelinha Neto[3], Daniel Souza e Silva Duarte[4], Elisangela Maria Nicolete Rampazzio[5], Angélica Augusta Grigoli Dominato[6], Luciane Schadeck[7], André Mio Takayama[8] and Lívia de Freitas Mendonça Gontijo[9]

ABSTRACT

Congenital anomaly of the coronary arteries (CACA) is a rare situation in the population, being accidentally found during coronary angiography due to suspicion of other pathologies. The individual may remain asymptomatic for a long period of time, making diagnosis difficult. Among the coronary irregularities is the circumflex coronary artery (Cx), which has been little reported in the literature. Thus, the present study aims to report a case of coronary anomaly, characterized by the duplicity of the Cx artery with anomalous origin in the right coronary artery, in a previously asymptomatic individual. The patient is a 57-year-old female patient with hypertension, diabetes, smoker and hypothyroidism. The patient sought medical attention due to chest pain of severe intensity, in tightness, associated with dyspnea on moderate exertion, which improved with rest. Coronary angiography showed left ventricular (LV) hypertrophy with preserved contractility and coronary anomaly, highlighting the presence of another Cx artery with anomalous origin in the right coronary artery, without the presence of a malignant pathway. After hospital discharge and outpatient return, the patient continues to be maintained with home drug therapy using enalapril, carvedilol, hydrochlorothiazide, simvastatin, ASA and levothyroxine. Although coronary anomalies are pathologies with a low population incidence, they can be potentially lethal, especially in young people, corresponding to the second leading cause of sudden death related to the cardiovascular system. Upon clinical suspicion, early diagnosis and treatment are of paramount importance.

Keywords: Coronary Anomaly, Double Circumflex Artery.

[1] Medical Student
University of the West of São Paulo
[2] Medical Student
University of the West of São Paulo
[3] Medical Student
University of the West of São Paulo
[4] Medical Student
University of the West of São Paulo
[5] Medical Student
University of the West of São Paulo
[6] Pharmaceutical
[7] Cardiologist
[8] Doctor
Cardiology Resident, Presidente Prudente Regional Hospital
[9] Medical
Anesthesiology Resident at Santa Casa de Misericórdia de Marília

INTRODUCTION

The coronary system, in its normal anatomy, is formed by the main coronary artery (originating from the left coronary sinus) and the right coronary sinus. The main coronary artery is divided into the anterior descending artery (DA) and the circumflex artery (Cx); the DA artery follows a posterior path to the pulmonary trunk, in the anterior interventricular sulcus; the Cx artery follows the posterior atrioventricular sulcus. From the right coronary sinus, the right coronary artery originates, which follows the path of the anterior atrioventricular sulcus. Thus, the occurrence of alterations in the suprascript anatomy are characterized as coronary anomalies9.

Congenital coronary artery anomaly (CACA) is an alteration resulting from disturbances during fetal development, causing anatomical variations regarding the origin, trajectory, termination or intrinsic anatomy of the coronary arteries8.

In the early stages of fetal development, within the human embryonic myocardium, vascular sinusoids develop that disappear when the myocardium becomes compact. At this time, they give rise to a network of veins, arteries and capillaries that communicate with other vessels present in the mediastinum around the 32nd day of gestation. After the formation of the aorta, from the division of the trunk arteriosus, around the seventh week of gestation, the primitive coronary vessels appear. These vessels develop and unite with the endothelial buds originating at the base of the trunk arteriosus, forming the definitive coronary artery system. Thus, factors such as anomalous involution, position of the endothelial buds, or septation of the trunk arteriosus can cause anomalies in the origin of the coronary arteries7.

ACCA is a rare situation in the population, being accidentally found during coronary angiography due to suspicion of certain pathologies3. Thus, the individual may remain asymptomatic for a long period of time, making the diagnosis difficult9. No data were found in the literature that reported differences in incidence in relation to gender or ethnicity7.

Chest pain, dyspnea or syncope are symptoms that occur in 18% to 30% of individuals with coronary anomalies7. Myocardial ischemia results from changes in perfusion caused by the movement of vessels with an anomalous trajectory during the cardiac cycle, which can cause acute myocardial infarction (AMI)[5].

The pathophysiology of the symptoms may be related to the proximal oblique course in the anomalous coronary artery, causing its ostium to have a slit shape that can collapse with the aortic expansion promoted in systole, resulting in impairment of the blood flow supplied to the myocardium. Thus, during physical exercise, the increase in systemic blood pressure and pulmonary territory can cause compression of the interarterial coronary segment, dynamic obstructions and, consequently, ischemia and arrhythmias2.

Another mechanism related to myocardial ischemia and sudden death is related to the occurrence of spasms in the anomalous coronary artery resulting from endothelial injury4. Studies indicate that ACAC corresponds to 17% of the causes of sudden death7.

In cases that portray a benign pathological trajectory, no greater risks to the individual with disease are demonstrated. However, there are situations with potential severity, which may trigger events such as myocardial ischemia, acute myocardial infarction, and sudden death, and the predictive factors of severity correspond to the origin and proximal course of the anomalous coronary artery9. The interarterial tract is considered malignant, since it is related to a higher risk of sudden death6. The Cx artery with an anomalous origin in the right coronary system is a coronary anomaly that has been rarely reported in the literature3.

RATIONALE

Studies performed by coronary angiography or autopsy indicate that the incidence of ACCA ranges from 0.3% to 1.5%[9]. However, it is estimated that coronary anomalies occur in less than 1% of the general population1. In Europe and the United States, the presence of ACAC is the second most frequent cause of sudden death related to the cardiovascular system in athletes, accounting for 12.2% to 17.2% of cases. Thus, athletes with coronary anomalies have a 79-fold increased risk of sudden death compared to non-athletes6.

Thus, as it is a rare pathology with lethal potential, especially related to premature morbidity and mortality in young adults9,6, this report contributes to the elucidation of the subject, since it is of paramount importance to establish early diagnosis and treatment. In addition, this study can serve as a basis for other health research.

GENERAL OBJECTIVE

To report a case of coronary anomaly characterized by duplicity of the circumflex artery with anomalous origin in the right coronary artery in a previously asymptomatic individual.

CASE DESCRIPTION

A 57-year-old female patient, hypertensive, diabetic, smoker, and hypothyroidism, sought medical attention due to severe chest pain, in tightness, associated with dyspnea on moderate exertion, which improved with rest.

Myocardial scintigraphy revealed transient hypoperfusion of the basal segment of the anterior wall of the left ventricle (LV), indirect signs of hypertrophic cardiomyopathy, and myocardial area at risk corresponding to 3% of the total myocardium. Coronary angiography revealed LV hypertrophy

with preserved contractility and coronary anomaly, highlighting the presence of another Cx artery with anomalous origin in the right coronary artery, without the presence of a malignant pathway.

After being hospitalized for 4 days, evolving hemodynamically stable and without intercurrences, the patient was discharged for home treatment using levothyroxine, enalapril, bisoprolol, simvastatin and metformin.

Ten days after hospital discharge, the patient returns for a follow-up appointment. She reported fatigue and angina on minimal exertion, and was classified in NYHA (*New York Heart Association) functional group III*. New laboratory tests and transthoracic echocardiogram were requested, which showed grade 1 LV diastolic dysfunction (relaxation dysfunction), LV concentric hypertrophy, mild mitral and tricuspid regurgitation, slight left atrial enlargement, and mild ascending aortic ectasia. The patient continues to be maintained with home drug therapy with the use of enalapril, carvedilol, hydrochlorothiazide, simvastatin, ASA and levothyroxine.

DISCUSSION

In 1933, the occurrence of anomalous origin of the Cx artery in the right coronary artery was described for the first time. In 2008, other authors reported a case of Cx artery duplicity. Subsequently, other cases of the presence of two Cx arteries were described in the literature3. This study reports a coronary abnormality evidenced by the presence of two Cx arteries, one of which has an anomalous origin in the right coronary artery.

The majority of ACAC patients are asymptomatic, which is a factor that hinders early diagnosis6,7. However, in the presence of symptoms, atypical chest pain, dyspnea, exercise-related presyncope or syncope, arrhythmias, and left ventricular dysfunction are often observed6. In the present case, the patient developed chest pain and dyspnea after a long period of asymptomatology.

In the study by Cosansu et al3, they reported a case of a patient with two Cx arteries, one of which originates in the left main trunk, and the other originates from the proximal part of the right coronary artery, showing great similarity with our study.

Regarding diagnosis, coronary angiography is considered the ideal test to diagnose coronary anomalies5,9. However, non-invasive imaging studies have shown better definitions of coronary anomalies related to the origin and course of these arteries. Thus, computed tomography of the coronary arteries demonstrates significant accuracy regarding the origin and proximal course of the ACCA. Transesophageal echocardiography is a high-sensitivity test to detect the anomalous origin of coronary arteries and to delineate the proximal course and blood flow pattern in these arteries9.

As for treatment, there are three types to be considered: 1- drug treatment and patient observation; 2- angioplasty with endoprosthesis placement; 3- Surgical treatment, and this procedure is recommended for most cases of anomalous origin of the left coronary artery6 and for patients with

significant symptoms4. In children, the anomalous origin of the left coronary artery in the pulmonary artery is indicated for surgical treatment9.

According to the *American College of Cardiology and the American Heart Association*, surgical revascularization is recommended for individuals who present: anomalous origin of the left main coronary artery with interarterial pathway; anomalous origin of the right coronary artery with interarterial tract associated with myocardial ischemia; and presence of myocardial ischemia in the territory of the anomalous coronary artery, with no other evident cause6.

The presence of ACAC as an anomalous origin of the left coronary artery in the right sinus or other coronary anomalies that show symptoms caused by ischemia, high-risk anatomy or major changes in perfusion, indicate surgical treatment, and it is important to advise the restriction of exercises until surgery. Postoperative follow-up is based on tests such as electrocardiogram and echocardiogram7.

Despite the presence of significant diffuse stenosis in the anomalous Cx artery reported by Cosansu et al3, interventions in this artery were not considered, since the symptoms presented by the patient were relieved after the procedure in dominant Cx. Another study presented an asymptomatic patient with Cx anomaly, and conservative treatment was chosen4. In our study, there was no need for surgical intervention to correct the patient's coronary anomaly, receiving only drug treatment to control previous comorbidities.

CONCLUSION

Coronary anomalies are pathologies with a low population incidence. However, they can be potentially lethal, especially in young people, and are the second leading cause of sudden death related to the cardiovascular system.

ACCA presents as asymptomatic and benign or malignant pathologies, expressing symptoms such as chest pain, dyspnea, syncope, and ischemic events, which may result in AMI.

Upon clinical suspicion, early diagnosis and treatment are of paramount importance. Computed tomography of the coronary arteries is the imaging test of choice. However, coronary angiography is more commonly performed.

REFERENCES

1. Almeida C, Dourado R, Machado C, Santos E, Pelicano N, Pacheco M, et al. (2012). Anomalias das artérias coronárias. Rev Port Cardiol, 31(7-8), 477-484.

2. Almeida DC, Carrijo AMM, Souza MG, Martinelli FM, Fazzio FR, O'Connell JL. (2021). Origem Anômala de Coronária Direita a partir do Seio Coronariano Esquerdo: como Conduzir? Arq. Bras. Cardiol., 34(1), eabc146.

3. Coşansu K, Ağaç MT, Kılıç H, Akdemir R, Gündüz H. (2018). Twin Circumflex Arteries: A Rare Coronary Artery Anomaly. J Teh Univ Heart Ctr, 13(1), 32-34.

4. Lopes MNSC, Leite EB, Oliveira CC. (2011). Origem anômala da artéria coronária direita. Brasília Med, 48(3), 341-344.

5. Martins MSS, Bastos ES, Annibal JV, Bezerra AB. (2007). Revascularização do miocárdio em origem anômala da artéria coronária direita: relato de caso. Rev. Bras. Cir. Cardiovasc., 22(4), 505-508.

6. Neves PO, Andrade J, Monção H. (2015). Artérias coronárias anômalas: o que o radiologista precisa saber. Radiol Bras, 48(4), 233–241.

7. Silva A, Baptista MJ, Araújo E. (2018). Anomalias congênitas das artérias coronárias. Rev. Port. Cardiol., 37(4), 341-350.

8. Silva ACO, Marinho LQ, Araújo LTA, Carvalho RCT, Cavalcanti TRF. (2019). Análise da incidência das variações anatômicas dos ramos das artérias coronárias. Rev. Nova Esperança, 17(1), 53-61.

9. Veras FHAP, Victor EG, Saraiva LCRS, Lopes MMU. (2007). Origem Anômala das Artérias Coronárias. Rev Bras Cardiol Invas, 15(3), 285-292.

Seizures in pediatrics: Challenges and strategies in urgency and emergency

https://doi.org/10.56238/sevened2024.005-002

Antônio Gabriel Prazeres Araújo[1], Barbara Vilanova Bezerra[2], Fernando Paiva[3], Isabella Morelli Lopes Gratão[4], Leonel Carmo Rodrigues[5], Mayumi Honda Pereira[6], Marlon Cantillo da Luz[7], Nicole Bento de Castro[8], Nicole Falone Resende Honorato[9] and Samara Ferreira Costa[10]

ABSTRACT

Seizures in pediatrics are presented as a medical urgency and emergency, requiring an immediate and specialized response. This condition challenges healthcare professionals to understand the specific nuances of seizures in children, from identifying triggers to implementing treatment strategies in an emergency setting.

Keywords: Seizures, Immediate Response, Seizure in Pediatrics.

[1] Medical students from UNITPAC ARAGUAÍNA
[2] Medical students from UNITPAC ARAGUAÍNA
[3] Medical students from UNITPAC ARAGUAÍNA
[4] Medical students from UNITPAC ARAGUAÍNA
[5] Medical students from UNITPAC ARAGUAÍNA
[6] Medical students from UNITPAC ARAGUAÍNA
[7] Medical students from UNITPAC ARAGUAÍNA
[8] Medical students from UNITPAC ARAGUAÍNA
[9] Medical students from UNITPAC ARAGUAÍNA
[10] Medical students from UNITPAC ARAGUAÍNA

INTRODUCTION

A seizure is a sudden, temporary event that results from abnormal electrical activity in the brain. During a seizure, brain cells (neurons) can send electrical signals in a disordered manner, leading to varying symptoms. These symptoms can include involuntary movements, muscle twitches, loss of consciousness and, in some cases, changes in behavior.

Seizures in children represent neurological events marked by disordered brain electrical activity, resulting in intense physical and behavioral manifestations. During a seizure, brain cells emit abnormal electrical signals, leading to symptoms that can range from involuntary movements to loss of consciousness.

Symptoms can include jerky muscle contractions, repetitive and uncoordinated movements, staring, excessive salivation, changes in skin color, and in some cases, temporary loss of consciousness. The duration and intensity of these episodes may vary, requiring careful attention for proper evaluation.

The classification of seizures in pediatrics is crucial to guide diagnosis and treatment. Seizures in children can have a variety of origins, and understanding these factors is essential for an effective approach to diagnosis and treatment. Some of the primary causes include conditions such as epilepsy, which can have both genetic origins and acquired through brain injuries or infections. In addition, high fevers in children, known as febrile seizures, can trigger episodes, usually between six months and five years of age, requiring medical evaluation.

Brain injuries, such as head trauma, brain malformations, tumors, or other abnormalities, can also be responsible for seizures in children. Metabolic disorders, such as those related to amino acid metabolism, glycogenoses, and urea cycle disorders, as well as central nervous system infections, such as meningitis and encephalitis, are among the potential causes. Certain congenital conditions and exposure to toxic substances, such as medications, drugs, or chemicals, can also contribute to seizures in children. Assessment of triggers is vital, involving a comprehensive analysis, including a detailed medical history, careful physical examination, imaging tests such as magnetic resonance imaging (MRI) and computed tomography (CT), laboratory tests, and electroencephalogram (EEG) to record brain electrical activity.

Careful evaluation of triggers is a crucial step in identifying the specific cause of seizures in children. This broad process comprises different steps, from the detailed review of the child's medical history, including previous medical events, neurological development, and exposure to potential triggers, to the assessment of general and neurological health status through physical examinations. In addition, procedures such as magnetic resonance imaging (MRI) and computed tomography (CT) scans are often used to examine brain structure, looking for lesions or abnormalities that may contribute to seizures.

Blood tests, as part of laboratory tests, are a common practice to identify metabolic or infectious disorders that may be related to seizures in children. The electroencephalogram (EEG), which records brain electrical activity, plays a crucial role in characterizing the nature of seizures, allowing the identification of characteristic patterns associated with different types of seizures.

METHODOLOGY

The theme "Seizures in Pediatrics: Challenges and Strategies in Urgency and Emergency" stands out for the complexity and urgency associated with seizure episodes in children. The methodological approach proposed to explore this theme involves the critical reading and analysis of scientific studies obtained from renowned databases, such as PUBMED, MEDLINE and SciELO. The search period, from January to February 2024, is delimited, searching for specific Descriptors in Sciences and Health (DeCS), including SEIZURES. IMMEDIATE RESPONSE. SEIZURE IN PEDIATRICS.

The methodology will be conducted in two distinct phases. Initially, an in-depth analysis of articles that address the etiology of seizures in children will be carried out, including triggering factors, classification and clinical manifestations. This first moment aims at a comprehensive understanding of the challenges faced in the management of these situations, including the urgency of intervention during seizures. In the second phase, research will focus on specific strategies and approaches for the management of seizures in pediatric urgency and emergency settings.

The careful selection of journals specialized in pediatrics, pediatric neurology and emergency medicine will contribute to the relevance and updating of the information obtained. The critical analysis of the final 25 studies, after rigorous application of the selection criteria, will allow the interpretation of the results in the specific context of seizures in pediatrics, outlining challenges and strategies relevant to urgency and emergency. This methodology aims to contribute significantly to the in-depth and scientifically based understanding of how to effectively address seizures in critical paediatric settings.

RESULTS AND DISCUSSION

Seizures are considered an urgency and emergency in pediatrics due to several factors that highlight the critical nature of these events for children's health. The occurrence of seizures can carry significant risks, including serious complications such as injuries during the seizure and breathing difficulties, which justifies the need for immediate intervention.

In the medical approach to a pediatric urgency and emergency related to seizures, the initial protocol stands out for the need for a rapid and precise intervention aimed at stabilizing the patient

and identifying the underlying cause. This multidisciplinary process entails a series of essential steps that reflect the medical expertise applied during the critical situation.

The procedure begins with a primary evaluation, aimed at ensuring an unobstructed airway, immediate assessment of vital signs, and identification of potential complications. The safety of the patient and medical staff is emphasized, with measures taken to remove hazardous objects and ensure a safe environment during the crisis.

Administration of anticonvulsants, such as diazepam or lorazepam, is considered, especially in cases of prolonged seizures, with the choice of drug guided by clinical response. At the same time, a detailed neurological assessment is carried out, including the use of specific scales to assess the level of consciousness. Diagnostic work-up includes comprehensive laboratory tests, such as complete blood count, electrolytes, and blood gases. Imaging tests, such as brain MRI, are indicated to identify possible structural abnormalities or brain lesions. The electroencephalogram (EEG) plays a crucial role, contributing to the evaluation of brain electrical activity and the identification of patterns associated with different types of seizures.

During the approach, respiratory and cardiovascular support is ensured, with the administration of oxygen and constant monitoring of cardiac function. Transparent communication with the family plays a key role by providing information about the child's condition, treatment plan, and subsequent steps. After stabilization, post-crisis guidance is provided to parents or guardians, addressing specific care, potential medication side effects, and the importance of ongoing medical follow-up. In more complex cases, referral to a paediatric neurology specialist may be indicated for a more specialised assessment.

FINAL THOUGHTS

The study on "Seizures in Pediatrics: Challenges and Strategies in Urgency and Emergency" highlighted the urgency and complexity of these events in children. It addressed challenges such as the diversity of causes, impact on vital functions and the need for rapid responses. Strategies, such as pharmacological interventions and respiratory support, were highlighted, with emphasis on the importance of the electroencephalogram in neurological evaluation.

In perspective, it has contributed to the in-depth understanding of the topic, providing valuable insights for health professionals and researchers. In short, they reinforce the relevance of integrated and holistic approaches in the management of seizures in pediatrics, aiming not only at immediate intervention, but also at prevention and long-term health promotion in children.

REFERENCES

1. Nicole-Carvalho, V., & Henriques-Souza, A. M. de M. (2002). Conduta no primeiro episódio de crise convulsiva. *Jornal de Pediatria*, 78, 148-156. http://dx.doi.org/10.1590/s0021-75572002000700004.

2. Zuberi, S. M., & Symonds, J. D. (2015). Update on diagnosis and management of childhood epilepsies. *Jornal de Pediatria*, 91(6), 67-77. http://dx.doi.org/10.1016/j.jped.2015.07.003.

3. Fábio, A., Antoniuk, S. A., Bruck, I., & Santos, L. C. dos. (2005). Tratamento do estado de mal epiléptico em pediatria: revisão e proposta de protocolo. *Journal Of Epilepsy And Clinical Neurophysiology*, 11(4), 183-188. http://dx.doi.org/10.1590/s1676-26492005000400006.

4. Vasconcellos, M. C. (2005). Febre, tosse e vômito. In: Leão E., Mota JAC, Corrêa EJ, Viana MB (Eds.), *Pediatria ambulatorial* (4ª ed., pp. 221-237). Belo Horizonte: COOPMED.

5. Dalbem, J. S., Siqueira, H. H., Espinosa, M. M., & Alvarenga, R. P. (2015). Febrile seizures: a population-based study. *Jornal de Pediatria*, 91(6), 529-534. http://dx.doi.org/10.1016/j.jped.2015.01.005.

6. Agarwal, M., & Fox, S. M. (2013). Pediatric seizures. *Emerg Med Clin North Am*, 31(3), 733-754. http://dx.doi.org/10.1016/j.emc.2013.04.001.

7. Sadek, A. A., Mohamad, M. A., Ali, S. H., Hassan, I. A. A., & Hussein, M. F. (2016). Diagnostic value of lumbar puncture among infants and children presenting with fever and convulsions. *Electronic Physician*, 8(4), 2255-2262. http://dx.doi.org/10.19082/2255.

8. Brasil, Ministério da Saúde. Fundação Oswaldo Cruz. (2003). *Manual de Primeiros Socorros*. Rio de Janeiro: Fundação Oswaldo Cruz.

9. Fernandes, M. J. da S. (2013). Epilepsia do lobo temporal: mecanismos e perspectivas. *Estudos Avançados*, 27(77), 85-98.

10. Honjoya et al. (2017). Crise convulsiva: relato de um treinamento. *Brazilian Journal of Surgery and Clinical Research*, 20(1), 104-107.

11. Lima, M. et al. (2019). Protocolo crises convulsivas. OMS. Organização Mundial da Saúde. Dados sobre crise Convulsiva. Recuperado de http://www.who.int/countries/bra/es/ - 2014.

Mental health of the psychologist working with the palliative care in Brazil

https://doi.org/10.56238/sevened2024.005-003

Tiago Moreno Lopes Roberto[1], Bianka Nayê Istécia de Oliveira[2], Joelma Santos Pereira Castilho[3], Elimeire Alves de Oliveira[4], Gerardo Maria de Araújo Filho[5], Lara Gonçalves de Sousa Liso[6], Sabrina Stefany Peres[7], Tiago Augusto Comino da Silva[8] and Sileno Marcos Araujo Ortin[9]

ABSTRACT

Palliative Care (PC) corresponds to the multidisciplinary practice of relieving pain and suffering in patients with progressive, chronic, incurable diseases or end-stage diseases or those of their families. This care aims to understand the patient in his or her full dimension, as a human being, to provide him with a better quality of life, mitigating and controlling symptoms of diseases caused by illness of a psychic, physical, organic, social, and spiritual nature, as long as there is life. The purpose of this study is to provide answers regarding the mental health of the psychologist when dealing with all the uncertainties, how he deals with the limitation of medicine, with the recognition of the uselessness of the treatment, with the acceptance of the death of his patient, with the difficulty of communicating the death to the family. The methodology used for the present work was bibliographic research, through the review of scientific articles published in certain platforms, such as SciELO, LILACS and Google Scholar, with the use of keywords to filter the publications and appropriate use. From the data obtained, it was concluded that, although it is a relevant and necessary subject, there is a

[1] Graduated in Psychology, Master in Health Psychology (FAMERP), PhD student in Health Sciences (FAMERP), Manager of Academic Policies of the Faculty (Futura), Professor of the Psychology and Dentistry Course (UNIRP). São Jose do Rio Preto – SP, Brazil.
E-mail: tiagomorenolopes@hotmail.com
[2] Graduated in Psychology (UNIRP). Guapiaçu – SP, Brazil.
E-mail: biaisttecia@gmail.com
ORCID: 0009-0001-4030-3220.
[3] Graduated in Psychology (UNIRP). São Jose do Rio Preto – SP, Brazil.
Email: joelmasantos.p@hotmail.com
ORCID: 0009-0003-2708-3977.
[4] Lecturer and Coordinator of the Pedagogy Course at Faculdade Futura. Graduated in Law. Graduated in Pedagogy (Antônio Augusto Reis Neves College). Graduated in Letters. Specialist in School Management (UNICAMP). Master's Degree in Teaching and Formative Processes (UNESP). Votuporanga – SP, Brazil.
E-mail: Elimeire.alves@gmail.com
ORCID: 0000-0002-4672-6013
[5] Post-Doctorate in Psychiatry from the Federal University of São Paulo (UNIFESP). Institution: Faculty of Medicine of São Jose do Rio Preto – SP, Brazil.
E-mail: filho.gerardo@gmail.com
ORCID: 0000-0001-7112-8456.
[6] Graduated in Psychology (UNIRP). São Jose do Rio Preto – SP, Brazil.
E-mail: laraliso@hotmail.com
ORCID: 0009-0002-8584-6701.
[7] Graduated in Psychology (UNIRP). São Jose do Rio Preto – SP, Brazil.
E-mail: psi.sabrinaperes@outlook.com
ORCID: 0009-0004-1154-9266.
[8] Graduated in Psychology (UNIRP). José Bonifácio - SP, Brazil.
E-mail: tacs011@outlook.com
ORCID: 0009-0005-7194-5583.
[9] Graduated in Business Administration, Master - Environmental Sciences - Universidade Brasil, Coordinator of the Courses of Administration, Human Resources Management and Accounting Sciences (FUTURA). Lecturer - Fatec Jales and Lecturer (Futura). Votuporanga -SP, Brazil
E-mail: sileno@faculdadefutura.com.br
ORCID: 0000-0002-2144-5944

scarcity of research in Brazil about the mental health of the Psychology professional and that there is still a predominance of the medical and technicist view, with a limited and retrograde perspective on "dying", without data that prove a better performance of the psychologist to deal with the finitude of life.

Keywords: Palliative Care, Acting with palliative care, Mental health.

INTRODUCTION

Since ancient times, there has been a concern with the health-disease issue, which is always present in the daily lives of individuals. However, certain diseases carried a negative and irretrievable stigma if diagnosed, such as cancer, leprosy, or other diseases. The author Hippocrates, according to Sales; Alencastre (2003, p. 566):

> [...] In his time, he stated that the disease of the mind also affects the body, and for the philosopher there was a link between the emotional state and the predisposition of the organism to diseases (1). From this perspective, according to the author's thinking, in the eleventh century, physicians had two fundamental obligations: to help relieve the symptoms of the sick, or to help them die, however, it never assumed the character of a fight against nature.

And, throughout history, there were people who were willing to take care of such patients who, at a given time, had no chance of improvement or survival. For this reason, places called "hospice" emerged, designed to shelter such individuals who needed shelter from their pain and suffering.

The origin of these places has a character of great importance, known by the name of Fabiola, a matron who still in the fourth century used her residence to welcome patients in need of care, offering them food, medicines and comfort to settle there, constituting a space beyond the stay, but a place of welcome, in which a whole relationship of hospitality was established between caregiver and sick (Sales; Alencastre, 2003).

In this sense, in 1842, Jeanne Garnier founded in Lyon a place especially dedicated to the care of the dying, becoming a significant point in the connection of palliative care for terminal patients, especially oncological patients, as would be seen later, with the foundation of several other hospices by different entities (Sales; Alencastre, 2003).

Subsequently, from the 80's, thanks to Cecily Saunders, Palliative Care gained strength, which was dedicated to the construction of an institution specialized in the care of patients diagnosed with neoplasms. In her journey as a nurse, she gained knowledge in medications used to relieve symptoms of patients with extreme pain, such as opioids, in general. From then on, she graduated in Medicine and became the first Doctor in Palliative Care, with a performance marked by the decrease in the use of injectable drugs, and greater use of oral medications (Ferreira; Lee; Melo, 2011).

With a focus on the health process linked to the individual-health-disease relationship, including work with family members and other professionals, Saunders brings the possibility of a differentiated form of treatment for those who are under Palliative Care, in a new biopsychosocial therapeutic proposal, avoiding the technicist context of the time, which prioritized more recent technologies and the diagnosed pathology. which marked the effective beginning of the relationship between medicine and other areas of health, including Psychology (Ferreira; Lee; Melo, 2011).

Health Psychology is considered an area within psychology that studies human behavior in the context of health and disease, with the objective of understanding the role of psychological variables in the maintenance of health, the development of diseases and behaviors related to disease, considering that the health psychologist works in the context in which the behavior occurs (Castro; Bornholdt, 2004; Kerbauy, 2002; Miyazaki et al., 2002; Yamamoto; Cunha, 1998; Yamamoto; Trinity; Oliveira, 2002). Health Psychology is a multidisciplinary field, involving branches of social and health sciences (Marks et al., 2000).

In 1980, there was a great development in the area, with the movement of public examinations in municipal, state and federal health institutions, despite the fact that the insertion of psychologists in health in our country had already begun in the 1950s, that is, before the regulation of the profession (Sebastiani, 2003).

In the national context, Health Psychology followed the development of Clinical Psychology, but acting in different areas, which demanded social commitment on the part of the professional (Seidl; Costa Júnior, 1999); In this context, Sebastiani (2000) points out that in the last fifteen years, the health area is the one that has hired the most psychologists.

The work of the health psychologist can be focused on health promotion and disease prevention, in clinical services to healthy or sick individuals. Most of the professionals work in hospitals, clinics and academic departments of colleges and universities (Sarafino, 2004).

Health psychologists are moving towards understanding how biological, social and behavioral factors influence health and disease, and how psychological factors influence health and reduce the risk of becoming ill, and can enable clinical services to healthy or sick individuals in various circumstances, and it is also possible to be included in research and teaching (Teixeira, 2004).

It can be considered that Health Psychology is established in a demarcated area, where the concept is absolutely compatible with the health proposals recommended by public health; however, the association and history of Psychology with Mental Health, added to the training based on the three bases - clinical, school and organizational - are crucial for this shift from the clinical model to public health (Bastos, 1990).

Ribeiro and Poles (2019) indicate that palliative care began to spread in Brazil in 1980. However, it was in 1997 that it expanded with the creation of the Brazilian Association of Palliative Care. In 1998, the National Cancer Institute (INCA) inaugurated a ward exclusively for the treatment of patients in palliative care. In February 2005, he founded the National Academy of Palliative Care (ANCP), with the purpose of contributing to the research, studies and optimization of palliative care in Brazil, thus making an important milestone for the area (Hermes; Lamarca, 2013). And in 2011,

the Federal Council of Medicine (CFM) recognized palliative care as an area of medical practice (Ribeiro; Poles, 2019).

According to the Ministry of Health (2018), regarding the Unified Health System (SUS), a resolution was published (Resolution No. 41, of October 31, 2018), which regulates palliative care as part of the continued care integrated into the SUS. The goal is to ensure that patients whose disease has no cure have a better quality of life from diagnosis to the terminal phase. Also, according to the Ministry of Health, the SUS already offers palliative care, however, there was still no defined norm to recognize the offer of palliative care.

It can be seen that the life expectancy of the population has been increasing, advances in health, science and technology have influenced this change. At the same time, it brings challenges to the health system, also providing changes in the focus of palliative care, which was initially focused on cancer, expanding to other chronic diseases and other care spaces (Silva; Nietsche; Cogo, 2022).

Ribeiro and Poles (2019) point out that the first system that users have access to is Primary Health Care (PHC), aiming to provide comprehensive care and assistance to patients. With the advancement of PHC, they included the Family Health Support Centers (NASF), providing a multidisciplinary network to assist professionals in primary care. In 2017, in the new Primary Care Policy, palliative care emerged, allowing the NASF to be maintained, contemplating the team assigned to palliative care (Rodrigues; Silva; Cobrera, 2022, p. 4).

Therefore, Primary Health Care (PHC) fulfills a responsibility to coordinate palliative care, playing a fundamental role in this environment of primary, secondary, tertiary and home care, enabling palliative care to be started early (Silva; Nietsche; Cogo, 2022).

In view of the professional practice of palliative care, the importance of a team of professionals who have theoretical, scientific, technical knowledge and clinical skills that encompass the physical, psychosocial, psychological and spiritual dimensions of the patient and include his or her family (Silva; Nietsche; Cogo, 2022).

Still, according to the authors, in the context of public policies, there is a need to understand, in view of the whole process and the magnitude that palliative care encompasses, whether professionals, multidisciplinary teams and primary care environments are prepared for the challenges and demands that arise under palliative care.

For Ribeiro and Carvalho Filho (2022), in addition to the challenge of improving health systems, contemplating issues such as health promotion and disease prevention, there is also a need to improve the prevention and relief of suffering, aiming to integrate and strengthen palliative care at all levels.

Guérin et al. (2001) say that the relationship between work and workers' health is complex, and that work can play a positive or negative role in workers' health, according to the conditions

found to perform it. He also suggests that "aggressions to health", the negative role of work in health, can be in the short, medium or long term.

Medeiros, Nunes and Melo (2012) state that there is little research carried out on the health of psychologists, studies on the subject are carried out with professionals who work in the hospital area. Medeiros, Nunes and Melo (2012) also point out that there is a greater academic concern to produce studies aimed at improving the psychic conditions of patients, and whether there is negligence in the health of workers and their need for care.

Silva (2010), on the mental health of psychologists, brings up issues that are harmful to the health of these professionals, such as the overload of the workday, lack of clarity in the performance of their function, lack of recognition by colleagues, emotional unpreparedness to deal with the situations they go through in the daily life of the hospital, among others.

According to Porto and Lustosa (2010), when the person begins the final phase of their life, or is in a life-threatening condition, this moment can become both a medical problem and a delicate situation for the team, involving technical knowledge and skills to deal with physiological and, especially, emotional issues that appear in the patient and his family.

To work in Palliative Care is to be in constant proximity to human vulnerability, suffering, the process of dying and death. This reality, which is inevitable in the profession, can bring, in addition to fatigue, suffering, and vulnerability that can lead to the development of Burnout Syndrome, that is, generalized exhaustion (physical and emotional), depersonalization, and lack of feelings of personal and professional fulfillment (Salazar, 2017).

METHODOLOGY

The present work was carried out through bibliographic research of recent books and scientific articles pertinent 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 "Palliative Care", "Psychology AND Palliative Care", "Mental Health and Palliative Care" and "Palliative Care AND Psychology" were used. Based on the research, the articles were chosen based on the year of publication.

The criteria for the inclusion and exclusion of the articles used were based on analyses of which were related to our theme and which dealt with the role of the psychologist in palliative care.

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 that are indispensable in the theoretical construction of the study.

The first stage of the current research is based on the survey of references on the subject subject. This search idealized the articles with wide coverage of the theme, 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 summaries that helped in the result of the work.

DEVELOPMENT

Investigating the mental health of the Psychologist in the face of Palliative Care in the Brazilian context is vital, because their personal well-being directly affects their ability to provide adequate care to patients. It is worth noting that understanding the challenges faced by psychologists can help implement policies and programs that promote their mental health, as well as improve the quality of services provided in healthcare.

Through these questions, the concept of the term in question was investigated, characteristics that propose the performance of the Psychologist within palliative care, such as where palliative care emerged, what were the first actions of Psychology at the international level, the performance of the Health Psychologist in various practices at the Brazilian level, palliative care at the SUS level in Brazil, the impacts that can be caused to the psychologist when dealing with the suffering of other people, and factors that can generate behavioral changes, in the short, medium and long term.

By observing the lack and limitation of academic research related to the proposed theme, it was noted the importance of developing a research project with an emphasis on the dissemination of knowledge about the mental health of psychologists in the area of palliative care.

Therefore, the project focuses on working on qualitative issues of how mental health is and how it is, in fact, and the psychologist's view in the face of this complex context that is the area of Palliative Care (PC), aiming at the dissemination of both the theme and the questioning in which it was made, which is little talked about.

In order to attract attention, the work will suggest some measures so that the psychology professional can improve their perspective and so that they can cope better, recognizing their limits and the importance of taking care of their own mental health.

RESULTS

Selected platforms with “Cuidados Paliativos” “Psicologia AND Cuidados Paliativos” “Saúde Mental AND Cuidados Paliativos” “Cuidados Paliativos AND Psicologia” “Cuidados Paliativos” “Psicologia AND Cuidados Paliativos” “Saúde Mental AND Cuidados Paliativos” “Cuidados Paliativos AND Psicologia”, were found the following articles, described in the table below:

Table 1 - Selected articles

Keyword	Platform	Articles Found	Discarded articles
Cuidados Paliativos	SCIELO	49 items found	31 discarded items
Psicologia **and** Cuidados Paliativos	SCIELO	21 items found	15 discarded items
Saúde Mental **and** Cuidados Paliativos	SCIELO	9 items found	7 discarded items
Cuidados Paliativos **and** Psicologia	SCIELO	20 items found	18 discarded items
Cuidados Paliativos	LILACS	258 items found	249 discarded items
Psicologia **and** Cuidados Paliativos	LILACS	115 items found	105 discarded items
Saúde Mental **and** Cuidados Paliativos	LILACS	86 items found	80 discarded items
Cuidados Paliativos **and** Psicologia	LILACS	331 items found	316 discarded items

Source: Authors (2023).

For the production of the work, the qualitative criterion was used, selecting articles that addressed, in a directed way, themes that encompassed palliative care in Brazil, such as, in this area, the view of the psychology professional, the impacts that are caused in these professionals, both positively and negatively. This selection of articles was made with the intention of narrowing the discussion, focusing on the mental health of psychologists and the importance of this perspective. Even though today there is no longer so much taboo about suffering, it was possible to notice a scarcity in the production of articles focused on this theme, with several academic works on the mental health of physicians and multidisciplinary teams, even on the families of patients, but not on the psychologist.

It is possible to notice the reflection of this lack when we look at the work of the psychologist and it is observed that it is highlighted that the professionals inserted in health services are somewhat disoriented, often developing clinical practice and not a hospital practice (Medeiros; Nunes; Melo, 2012). In addition, the difficulty of psychologists in working together with the team is reported, developing a solitary activity that is little recognized by colleagues. This lack of clarity and orientation for the performance of the psychologist's practice in health is also perceived at other levels of care, such as in the spaces of the Basic Health Units, and the clinical model, recognized as classic, is often reproduced in the performance of these professionals (Archanjo; Schraiber, 2012), which often leads to work overload.

Romagnoli (2009, p. 527) states that "although a significant portion of psychologists work in the health area, there is still a gap between the training found in Psychology courses and the demands of this insertion".

DISCUSSION

Death has always been a subject of fascination and, at the same time, of fear for human beings who are forced to live with its constant threat looming over their lives. According to Kovács (2005), the theme began to be seen in a negative social way in the twentieth century, and even in the twenty-first century, the communication of such an issue is still not accepted, however, it is increasingly present in our routine.

Within this context, some forms of escape from the fate of mortals emerge, such as the preservation of the cult of beauty; society then decides to impose rituals that allow a better visualization of an individual's remains, so that cremation (one no longer needs to look at the corpse) and necromakeup, so that the decomposition of the body can be pleasantly disguised (Custódio, 2013).

Nevertheless, it is necessary to think of death as a process inserted in a specific culture, in this case, the Brazilian culture in a generalized way. However, it can be seen that this phenomenon can vary between historical eras and peoples, as presented by Silva and Scorsolini-Comin (2022), when proposing a visit to the representations of death throughout history: Egyptians, Aztecs, Mexicans, and Indians.

Of paramount importance is the perspective of the Aztecs and Mexicans, whose view of dying was linked to the salvation of life and, thus, a constant remembrance and celebration of the living about the death of their loved ones, contrary to the culture of forgetting the dead in the West (Silva; Scorsolini-Comin, 2022).

Further, thanks to the constant evolution of medicine over the years and, with it, the advances in the treatment of diseases that previously could lead to the death of the patient, life has extended and professionals increasingly seek to escape from the inevitable death, which can cause a prolongation of life without an adequate look at the quality of life. process characterized as Dysthanasia (Kovács, 2005).

In a study conducted by Gilbert and Rosa (2020), with three elderly people who agreed to participate to discuss how they dealt with the future death in their lives, due to their advanced ages and possible diseases, an acceptance of the fate that awaited them could be observed, which was not accepted by their families or even by the doctors who treated them.

The research participants reported rituals and wills already made so that their wishes about how they would like to die or what to do with their belongings were fulfilled, such as the anxiety for not wanting to have their last moments in a hospital environment, but rather in their residence, or the transfer of their financial income to a closer grandchild (Gilbert; Rosa, 2020).

However, according to the researchers, Gilbert and Rosa (2020), they faced difficulties when trying to plan how they would do such questions when talking to their doctors, who did not want to

talk about the subject of their possible deaths, with the aim of focusing only on living, in the search for a life that should be even longer.

Thus, the conflict between the process of acceptance of "living-dying" can be perceived, not only in daily life in general, but also in hospital environments, where death is not talked about, despite being present at all times, as it must remain hidden under the eyes of professionals who face it every day (Santos et al., 2016).

With regard to what was observed by Santos et al. (2016), health professionals in institutions are unaware of the concepts of dysthanasia and orthothanasia, the latter known as a process of quality death, without unnecessary suffering or prolongation of life; As a result, there is an unnecessary expenditure on resources that could be used for patients with real needs, in addition to a meaningless approach in their actions towards others.

From the perspective of the psyche of such workers, it can be observed that, despite such difficulties in dealing with the death of others and, therefore, of oneself, there are still different perspectives within this scope, as concluded in a study carried out by the authors Porto et al. (2014), aimed at professionals in the oncology area who came to have a loved one in palliative care, as described below.

The consensus reached in this study was that the workers are chosen by the families with a patient in palliative care so that he/she is responsible for the treatment and care of the patient, which also demonstrated, according to the reports, that the death experienced in hospital beds enabled a possible preparation and a new vision when dealing with the disease and the end of the life of a loved one. as well as for oneself (Porto et al., 2014).

Unfortunately, due to the absence of a specific look at the mental health of psychology professionals, immersed in these contexts of constant death and relationship with the other, it was not possible to obtain research that contemplated the very finitude of the psychologist and his own ways of dealing with the dying process, which confirms the precariousness of the discourse about death in institutions. whatever they are.

Therefore, in order for the taboo on the subject to be gradually dissolved, it is extremely important that undergraduate courses in the areas of health introduce in their curricula disciplines that can transmit the necessary knowledge and reflection on what death is in such a context, possible rituals involved, the spirituality of patients, respect for last wishes, among other points (Alves; Oliveira, 2022).

Suffering is a situation of great distress, associated with events that threaten the dignity of an individual. Suffering demands self-awareness, encompasses emotions, and impacts personal relationships and the individual's body. This existential situation of great distress stems from what the

individual perceives with his or her inner self, often linked to emotions and feelings, such as frustration, anxiety, sadness, etc. (Cassell, 2004).

In this sense, it is observed that suffering is the loss of meaning, disorganization of emotions, symptoms, the impossibility of putting into words, of explaining, of representing oneself (Dejours, 1998).

Suffering can occur without being linked to physiological disease. It is possible to cite causes socially attributed to suffering, such as grief, isolation, unemployment, fear, hopelessness... Thus, suffering is a subjective experience, an individual can experience situations in suffering that do not cause any type of distress to other people (Frankl, 1973, Lukas, 2005, Fauré, 2012).

One of the sufferings among professionals in the hospital context is found in the coping strategies in the face of death, as it is observed that these professionals find it difficult to deal with patients who have a prognosis of death, some of these professionals are unable to deal with the experience of grief, and it can be said that these attitudes are ways of protecting themselves or even lack of preparation to deal with these situations (Silva Júnior et al., 2012).

The belief that surrounds this circumstance is also mentioned about the professional posture taught, that they should behave in a rigid manner, and not show their feelings, as it would negatively influence their image, since it is still commented among professionals, who should be indifferent to the suffering/death of the patient (Silva Júnior et al., 2012).

According to Barban and Leonardi (2018), validation is defined as understanding, in order to validate the thoughts, emotions, and internal feelings of the other, in view of this, validation is a way of reinforcing the individual's behavior to share their emotions.

When the exposure of such feelings is invalidated, emotions and behaviors are idealized as inappropriate, thus they are minimized and neglected, thus presenting the extinction of the individual's behavior (Silva Júnior et al., 2012).

There are several benefits that validation can bring to the individual, such as supporting the quality of interpersonal relationships and strong psychological functioning, and reducing negative emotions. While invalidation can bring negative results, such as difficulty adapting to stressful activities, and allow emotional dysregulation (Linton et al., 2012 *apud* Barban; Leonardi, 2018).

Professionals in the palliative care team, as well as in other areas of health, experience daily grief in their professional practice, however, Kovács (2010) raises important reflections on the subject when discussing whether professionals have the right to expose their suffering or, if they were instructed in their training, to pay attention to their emotions, in the face of the loss of patients.

Professionals in the area of palliative care, when constantly faced with death, portray difficulties with their relationships within the work environment, both with the coexistence with the team of professionals and with patients and their companions. These events can be triggered by

situations of stress, where there are difficult ways to resolve, resulting in feelings of powerlessness and frustrations (Kovács, 2010).

According to Kovács (2010, p. 424) "Working in the health area, as a caregiver, immediately presents the following finding: pain and death are present in your daily life".

Therefore, because they always experience constant suffering, both material and symbolic, suffering and grief are not recognized several times by professionals, resulting in persistent emotional suffering (Morais et al., 2019).

For Pozzada, Santos and Santos (2022), the psychologist in relation to palliative care care, in addition to facilitating communication, should provide and bring together patients who are in the last moments of life, and around them, the rescue of their history, desires, desires, understand and establish the patient's significant relationships, providing emotional support to family members and patients.

However, it is also extremely essential to perceive the fragility, psychosocial, existential, and well-being aspects of the professional who is placed in this scenario.

The challenges of psychology professionals are great in this context, marked by the denial of patients and families by the finitude of life, severity of the disease, and all the suffering present, making the empathy, technique and humanization of the psychologist crucial in the face of the imminence of death, and providing relief to the sick person and the family (Alves et al., 2015).

However, there is little research and theoretical framework, considering possible effects and processes that maximize conditions aimed at promoting the mental health of psychologists, in addition to the subjective concern that is behind that professional. Emphasizing that it is necessary to constantly invest in learning, encompassing technical knowledge, development of socio-emotional skills (Pozzada; Saints; Santos, 2022).

In addition, of course, a look and support to the psychologist, who also has his limitations, fears, traumas, insecurities, especially in daily contact with death and diseases, end up evoking a perception of one's own finitude.

In addition, Hermes and Lamarca (2013) present that there is a need to propose in the students' curriculum, studies related to thanatology, that is, the study of death, in this perspective to address aspects still in graduation and after graduation, about the fragility of life and the process of dying, stimulating from the beginning the feelings and the perception of finitude, it is important to enter this environment as naturally as possible (Vicensi, 2016).

With regard to Bolze and Castoldi (2005), the constant work of the psychologist on this border between life and death, effectively performing his interventions and skills, is equally necessary for him to receive psychological support, since his work implies the good management of his own emotions, and of the triad patient, family and team.

Emotional support can often come from the team itself, using the welcoming among themselves, as a conduit to alleviate the challenges, deal with the terminality of users, sharing experiences, aiming to help in the suffering of patients, family members and, consequently, the team itself (Porto et al., 2014).

Thus, Cardoso et al. (2013) state that it is necessary to consider strategies for psychologists, as well as the multidisciplinary team, to be able to express their anxieties and challenges related to their difficulties in the work scenario, such as frustration, feelings of powerlessness and all psychic aggravation, promoting care in the human being who will provide care.

Therefore, the psychologist's responsibility is intense and extensive, and psychotherapeutic support is indispensable. Health work, especially in the context of palliative care, can lead to psychological consequences, affecting the professionals' professional and personal lives. Emotional exhaustion, reflection on death and even coming across sensitive content that the psychologist crosses may arise, further reinforcing the importance of care and support in the psychological sphere.

In addition, the psychologist needs to develop his self-observation, that is, to perceive and understand his emotional state, to recognize his weaknesses, his limits, to bring attention to himself, seeking to manage coping processes, to normalize the feelings that may arise in the exercise of his profession and the awareness to seek help, when necessary, and a priori as well, as prevention and promotion of mental health and self-knowledge.

Repeatedly, the psychologist is required to be free from suffering or any feeling that leaves him in a position of vulnerability. Senço (2016, p.141-144) states that "the professional who takes care of the suffering of the other is not allowed to suffer", so it is determined that the psychologist, even with all his theoretical baggage, explains his humanity and right to suffering, it is more complex to vent and ask for help.

The American Psychological Association *(APA) Code of Ethics* points out the need for psychologists, interns, and academics "to be aware of the possible impact of their own physical and mental health on their ability to help those with whom they work" (APA, 2002, p. 1062).

Therefore, it is estimated that these professionals acquire daily self-care, reflecting on their self-awareness, self-reflection, and the search for their physical and psychological well-being. Psychotherapy and supervision are important for the personal and professional development of the individual, promoting growth and learning.

A study carried out in Madrid points out that there is a variable in the level of stress and satisfaction among mental health professionals who work in health centers and hospitals. In health centers, a more favorable level of personal fulfillment at work was identified than in hospitals (Garcia; Cabeza; Fernandez, 1998).

According to Jung (1981, p. 111), the therapist "will only heal to the extent of his own suffering". In view of the assumption, it is again emphasized the importance of the psychology professional constantly performing his/her self-assessment, being under analysis, and with the allied supervisions in his/her care. The therapist also carries his anguish, has intimacy with suffering, so it is necessary to reflect constantly so as not to normalize such feelings.

It is also worth highlighting the fundamentality of the hospital psychologist's role as a holder of achievements, encounters and significant moments for his profession, being a reinforcer and generating empathy in the professional's external social relations.

From this perspective, the authors Morais and Koller (2004) discuss whether resilience is an ally for health protection for mental health professionals and, subsequently, other positive aspects such as self-determination, hope, creativity and interpersonal skills are highlighted.

In view of this scenario, there is a scarcity of articles on the positive impacts of the psychologist in the hospital context, and it is necessary to deepen scientific research to raise awareness and value the other side of this profession.

What makes man human is to be self-conscious. However, this will only be possible from the moment one becomes aware of one's own death, and it, as difficult as it may be, is part of the life of each individual, even if we often do not realize it.

According to Kovács (2003), the way one sees death will certainly influence one's way of being. This author comments that, during the whole process of vital development, there is an intertwining of life and death, and that those who believe that death is only a problem at the end of life, and that only at this moment should they think about it, are mistaken. After all, death reveals the integrity of life, manifesting its meaning, since only by experiencing his own finitude does man achieve the totality and fullness of his humanity, as Brugger (1969) states.

In view of the above, the question remains: how to maintain life in the face of a situation that fosters death? To what extent will this life absorb such care offered in this period of pain and suffering? Bringing these issues to reflection, it is understood that hospital psychology is a tool of paramount importance in palliative care, seeking to provide patients with a humanization that provides them with a good death, since taking care of such pain may rescue a little of the dignity of the other in this critical context.

The hospital psychologist looks at the patient as the protagonist, as the subject of a story and a life and not as a prisoner of an incurable disease, bringing to the context a view that no matter how limiting the disease is, there are possibilities of adaptation, maintenance of dignity and rescue.

It is important to emphasize that medicine alone is not enough for the terminally ill patient to have a good quality of life, it is necessary to associate it with multidisciplinary care, especially the

psychological support that is extremely necessary to the extent that the patient experiences symptoms beyond the physical, the psychological symptoms that arise during the terminal phase.

In the midst of the cold scenario of technological medicine, Pessini (2002) has lost the humanism in caring, in the affectivity of the caregiver-patient relationship and in this scenario we can also highlight that suffering requires compassion, respect, that is, empathy in each action performed. Unfortunately, indifference and also the naturalization of the suffering of the other is a factor in which it has been growing.

Nowadays, says Almeida (2007), humanization is linked not only to the valorization of care, but also to ethical and scientific issues and to the rights of the patient, valuing the individuality of the patient, as well as his dignity, autonomy, and subjectivity.

According to Oliveira (2001), humanizing is characterized by putting one's head and heart into the task to be developed, giving oneself in a sincere and loyal way to the other, and knowing how to listen with science and patience to words and silences. The relationship and direct contact make us grow, and it is in this moment of exchange that I humanize, because then I can recognize and identify myself as people, as human beings.

Providing care to this patient involves, above all, integrating the various dimensions of the being, this also includes the spiritual aspect. Studies show that issues related to spirituality represent for cancer patients, for the most part, a source of comfort, faith in God and support to cope with the disease, presenting themselves as a contributing factor in treatment adherence (Fornazari; Ferreira, 2010).

Therefore, for the psychologist, it is essential to perceive the religious phenomenon as a resource that makes it possible to seek alternatives to reinforce the patient's emotional support, providing, among other things, meaning to life and to the human suffering present in the disease process (Silva, 2010, p. 33-51). This is what Barbosa and Freitas (2009, p. 2) call the "Psychology of Religion".

CONCLUSION

In view of the bibliographic research, it was possible to verify that the Psychology professional has a fundamental role in the field of health, becoming a key piece for understanding the subjective aspects in moments that require a different look at human suffering.

About the multidisciplinary team in palliative care, the psychologist has his attribution mainly in mental health, in the well-being of patients, family members and consequently of the team. The importance of the psychologist in this context is perceived in view of his expertise, technique, empathy, and active listening, which allows him to have a humanized look, beyond physical pain,

encompassing socio-emotional and psychological aspects, managing emotions and care with regard to this delicate moment.

However, there is a scarcity of research on the mental health of psychologists in Brazil working in health, and existing research points to the illness of several professionals in the multidisciplinary team and possible support interventions; However, there is still a lack of data on interventions and support for working psychology professionals. It is understood that the figure of the Psychologist is always seen as a source of support and support, stigmatizing, and denying that these professionals can also experience suffering.

The stigma that psychologists cannot or will not go through their vulnerabilities, transferences, fears and insecurities, whether of an emotional or professional nature, comes from external contact and from the professionals themselves, who judge it as a weakness, which makes it difficult to seek therapy help, which generates difficulty in getting in touch with their self-reflection and self-observation of their own psychological issues and when dealing with the terminality of life. These difficulties may come to the fore even more.

Therefore, the present research hoped to contribute to new field research in the search to understand the relationships of help and support in the work of psychologists in the field of health.

REFERENCES

1. Almeida, D. V. (2007). O ensino da humanização nos currículos de graduação em enfermagem. Dissertação (Mestrado em Enfermagem) - Universidade de São Paulo, São Paulo.

2. Almeida, R. A., & Malagris, L. E. N. (2011). A prática da psicologia da saúde. *Sociedade Brasileira de Psicologia Hospitalar*, 14(2), 183-202.

3. Alves, R. F., et al. (2015). Cuidados paliativos: desafios para cuidadores e profissionais de saúde. *Fractal: Revista de Psicologia*, 27(2), 165-176.

4. Alves, R. S. F., & Oliveira, F. F. B. (2022). Cuidados Paliativos para Profissionais de Saúde: Avanços e Dificuldades. *Psicologia: Ciência e Profissão*, 42, 1-16.

5. APA - Associação Americana de Psicologia. (2022). Princípios éticos dos psicólogos e código de conduta. *American Psychologist*, 57, 1060-1073.

6. Archanjo, A. M., & Schraiber, L. B. (2012). A atuação dos psicólogos em unidades básicas de saúde na cidade de São Paulo. *Saúde e Sociedade*, 21(2), 351-363.

7. Barbán, M., & Leonardi, J. L. (2018). Efeitos da validação e invalidação no desempenho em corrida de atletas. *Revista Perspectivas*, 9(1), 60-78.

8. Barbosa, K. A., & Freitas, M. H. de. (2009). Religiosidade e atitude diante da morte em idosos sob cuidados paliativos. *Revista Kairós*, 12(1), 113-134.

9. Barus-Michel, J., & Camps, C. (2003). Sofrimento e perda de sentido: considerações psicossociais e clínicas. *PSIC - Revista de Psicologia da Vetor Editora*, 4(1), 54-71.

10. Bastos, A. V. P. (1990). Mercado de trabalho: uma velha questão e novos dados. *Psicologia: Ciência e Profissão*, 2(4), 28-39.

11. Bolze, S. D. A., & Castoldi, L. (2005). O Acompanhamento familiar antes e depois da morte da criança: uma proposta de intervenção para o psicólogo hospitalar. *Aletheia*, (21), 79-91.

12. Brugger, W. (1969). *Dicionário de filosofia*. São Paulo: Herder.

13. Cardoso, D. H., et al. (2013). Cuidados paliativos na assistência hospitalar: a vivência de uma equipe multiprofissional. *Texto contexto de Enfermagem*, 22(4), 1134-1141.

14. Cassell, E. J. (2004). *The nature of suffering and the goals of medicine*. Oxford: Oxford University Press.

15. Castro, E. K. de, & Bornholdt, E. (2004). Psicologia da saúde x psicologia hospitalar: definições e possibilidades de inserção profissional. *Psicologia Ciência e Profissão*, 24(3), 48-57.

16. Custódio, E. M. (2013). Maria Julia Kovács: uma pesquisadora refletindo sobre a morte. *Boletim - Academia Paulista de Psicologia*, 33(85), 243-253.

17. Dejours, C. (1998). *Souffrance en France*. Paris: Seuil.

18. Faure, C. (2012). *Vivre le deuil au jour le jour*. Paris: Albin Michel.

19. Ferreira, A. P. de Q., Lopes, L. Q. F., & Melo, M. C. B. de. (2011). O papel do psicólogo na equipe de cuidados paliativos junto ao paciente com câncer. *Sociedade Brasileira de Psicologia Hospitalar*, 14(2), 85-98.

20. Fornazari, S. A., & Ferreira, R. E. R. (2010). Religiosidade/Espiritualidade em pacientes oncológicos: qualidade de vida e saúde. *Psicologia: Teoria e Pesquisa*, 26(2), 265-272.

21. Frankl, V. (1973). *Psicoterapia e sentido da vida*. São Paulo: Quadrante.

22. Garcia, M. S. O., Cabeza, I. G., & Fernandez, L. M. (1998). Burnout en profesionales de salud mental. *Anales de Psiquiatria*, 14(2), 48-55.

23. Giberti, G. M., & Rosa, H. R. (2020). Preparação para a morte: investigação fenomenológica sobre a experiência de idosos longevos. *Psicologia USP*, 31, 1-9.

24. Gorayeb, R. (2010). Psicologia da saúde no Brasil. *Psicologia: Teoria e Pesquisa*, 26(N. Especial), 15-122.

25. Guérin, F., et al. (2001). *Compreender o trabalho para transformá-lo: a prática da ergonomia*. São Paulo: Edgard Blücher.

26. Hermes, H. R., & Lamarca, I. C. A. (2013). Cuidados paliativos: uma abordagem a partir das categorias profissionais de saúde. *Ciência & Saúde Coletiva*, 18(9), 2577-2588.

27. Jung, C. G. (1981). *A prática da psicoterapia*. Rio de Janeiro: Vozes.

28. Kerbauy, R. R. (2002). Comportamento e saúde: doenças e desafios. *Psicologia USP*, (13), 11-28.

29. Kovács, M. J. (2003). Bioética nas questões de vida e morte. *Psicologia USP*, 14(2), 115-167.

30. Kovács, M. J. (2005). Educação para a morte. *Psicologia: Ciência e Profissão*, 25(3), 484-497.

31. Kovács, M. J. (2010). Sofrimento da equipe de saúde no contexto hospitalar: cuidando do cuidador profissional. *O Mundo da Saúde*, 34(4), 420-429.

32. Lima, C. M. N., & Costa, L. N. R. (2023). O psicólogo no enfrentamento do sofrimento dos profissionais no âmbito dos cuidados paliativos ante a angústia da morte dos pacientes. *Revista Ibero-Americana de Humanidades, Ciências e Educação-REASE*, 9(3), 453-465.

33. Lukas, E. (2005). *Histórias que curam… porque dão sentido à vida*. Campinas: Verus.

34. Marks, D. F., et al. (2000). *Health psychology: theory, research and practice*. London: Thousand Oaks; New Delhi: Sage Publications.

36. Medeiros, M. A. V. de, Nunes, M. L. T., & Melo, F. da F. M. de. (2012). Saúde mental de psicólogos trabalhadores na saúde pública: um estudo a partir de Dejours e Freud. *Anais do VIII Seminário do Trabalho: Trabalho e Políticas Sociais no Século XXI*. Marília, SP: UNESP.

37. Miyazaki, M. C. O. S., et al. (2002). Psicologia da Saúde: extensão de serviços à comunidade, ensino e pesquisa. *Psicologia USP*, (13), 29-53.

38. Morais, J. L. M., et al. (2019). Frieza ou sensibilidade com a dor do outro? o luto não reconhecido do profissional de saúde. *Anais do VI Simpósio Multiprofissional de Oncologia*. Anais... Fortaleza (CE) CRIO.

39. Morais, N. A. de, & Koller, S. H. (2004). Abordagem ecológica do desenvolvimento humano, Psicologia positiva e resiliência: ênfase em saúde. In S. H. Koller (Org.), *Ecologia do desenvolvimento humano: pesquisa e intervenção no Brasil* (pp. 91-107). São Paulo: Casa do Psicólogo.

40. Oliveira, C. C. (2016). Para compreender o sofrimento humano. *Revista de Bioética*, 24(2), 225-234.

41. Oliveira, M. E. de. (2001). Mais uma nota para a melodia da humanização. In M. E. de Oliveira, M. de F. M. Zampieri, & O. M. Bruggemann (Eds.), *A melodia da humanização: reflexos sobre o cuidado durante o processo do nascimento* (p. 121). Florianópolis: Cidade Futura.

42. Pereira, S. M., Fonseca, A., & Carvalho, A. S. (2011). Burnout in palliative care: a Systematic review. *Nursing Ethics*, 18(3), 317-326.

43. Pessini, L. (2002). Humanização da dor e sofrimento humanos no contexto hospitalar. *Bioética*, 10(2), 51-72.

44. Pires, A. C. T., & Braga, T. M. S. (2009). O psicólogo na saúde pública: formação e inserção profissional. *Temas em Psicologia*, 17(1), 151-162.

45. Porto, A. R., et al. (2014). Visão dos profissionais sobre seu trabalho no programa de internação domiciliar interdisciplinar oncológico: uma realidade brasileira. *Av. Enferm.*, XXXII(1), 72-79.

46. Porto, G., & Lustosa, M. A. (2010). Psicologia Hospitalar e Cuidados Paliativos. *Sociedade Brasileira de Psicologia Hospitalar*, 13(1), 76-93.

47. Pozzada, J. P., Santos, M. A. dos, & Santos, D. B. (2022). Sentidos produzidos por psicólogos que trabalham com cuidados paliativos no Sistema Único de Saúde (SUS) sobre o cuidar em cenários de morte e morrer. *Interface - Comunicação, saúde, educação*, 25, 1-16.

48. Ribeiro, D. L., & Carvalho Filho, M. A. de. (2022). Cuidados paliativos na emergência: invocando Kairós e repensando os sistemas de saúde. *Cadernos de Saúde Pública*, 38(9), 1-6.

49. Ribeiro, J. R., & Poles, K. (2019). Cuidados Paliativos: Prática dos médicos da Estratégia Saúde da Família. *Revista Brasileira de Educação Médica*, 43(3), 62-72.

50. Rodrigues, L. F., Silva, J. F. M. da, & Cabrera, M. (2022). Cuidados Paliativos: percurso na atenção básica no Brasil. *Caderno Saúde Pública*.

51. Romagnoli, R. C. (2009). Breve estudo institucionalista acerca do Programa de Saúde da Família. *Saúde e Sociedade*, 18(3), 525-536.

52. Rutz Porto, A., et al. (2014). Visão dos profissionais sobre seu trabalho no programa de internação domiciliar interdisciplinar oncológico: uma realidade brasileira. *av.enferm.*, 32(1), 72-79.

53. Salazar, H. (2017). *Intervenção psicológica em cuidados paliativos*. Lisboa: Pactor.

54. Sales, C. A., & Alencastre, M. B. (2003). Cuidados paliativos: uma perspectiva de assistência integral à pessoa com neoplasia. *Revista Brasileira de Enfermagem*, 56(5), 566-569.

55. Santos, F. P. P. G. dos, et al. (2016). Ortonásia e Distanásia: Percepção dos profissionais de saúde de uma unidade de terapia intensiva. *Ciência, Cuidado e Saúde*, 15(2), 288-296.

56. Sarafino, E. P. (2004). Context and Perspectives in Health Psycology. In S. Sutton, A. S. Baum, & M. Johnston (Eds.), *The Sage Handbook of Health Psychology* (pp. 01-26). New Delhi: Sage Publications.

57. Sebastiani, R. W. (2000). Histórico e evolução da psicologia numa perspectiva Latino Americana. In V. A. Angerami-Camon (Org.), *Psicologia da saúde: Um novo significado para a prática clínica* (pp. 201-222). São Paulo: Pioneira.

58. Sebastiani, R. W. (2003). Psicología de la salud en Brasil: 50 años de historia. *Suma Psicológica*, 10, 25-42.

59. Seidl, E. M. F., & Costa Junior, Á. L. (1999). O psicólogo na rede pública de saúde do Distrito Federal. *Psicologia: Teoria e Pesquisa*, 15(1), 27-35.

60. Senço, N. M. de, et al. (2016). A saúde mental dos profissionais de saúde. In Q. Cordeiro, D. Razzouk, & M. G. A. Lima (Orgs.), *Trabalho e saúde mental dos profissionais da saúde* (Vol. 1, pp. 141-144). São Paulo: CREMESP.

61. Silva Júnior, F. J. G. da, et al. (2012). Processo de morte e morrer: evidências da literatura científica de Enfermagem. *Revista Brasileira de Enfermagem - REBEn*, 64(6), 1122-1126.

62. Silva, A. A. da, & Scorsolini-Comin, F. (2022). Refletindo sobre a morte, o morrer e os mortos com estudantes do ensino fundamental. *Educ. Teoria Prática*, 32(65), e31.

63. Silva, A. B. H. C. da. (2010). O estresse na prática profissional do psicólogo em UTI: uma revisão de literatura. *Sociedade Brasileira de Psicologia Hospitalar*, 13(1), 33-51.

64. Silva, K. S. da, & Kruse, M. H. L. (2012). Em defesa da sociedade: a invenção dos cuidadios paliativos. *Revista da Escola de Enfermagem da USP*, 46(2), 460-465.

65. Silva, T. C. da, Nietzsche, E. A., & Cogo, S. B. (2022). Cuidados Paliativos na Atenção Primária à Saúde: revisão integrativa de literatura. *Revista Brasileira de Enfermagem*, 75(1), 1-9.

66. Teixeira, J. A. C. (2004). Psicologia da Saúde. *Análise Psicológica*, XXII(3), 441-448.

67. Valadares, C. (2018). Ministério da saúde normatiza cuidados paliativos no SUS. Recuperado de https://www.gov.br/saude/pt-br/assuntos/noticias/2018/novembro/ministerio-normatiza-cuidados-paliativos-no-sus#:~:text=O%20Minist%C3%A9rio%20da%20Sa%C3%BAde%20publicou,%C3%9Anico%20de%20Sa%C3%BAde%20(SUS)

68. Vicensi, M. do C. (2016). Reflexão sobre a morte e o morrer na UTI: a perspectiva do profissional. *Revista Bioética*, 24(1), 64-72.

69. Yamamoto, O. H., & Cunha, I. M. F. F. Oliveira. (1998). O psicólogo em hospitais de Natal: uma caracterização preliminar. *Psicologia: Reflexão e Crítica*, 11, 345-362.

70. Yamamoto, O. H., Trindade, L. C. B. O., & Oliveira, I. F. de. (2002). O psicólogo em hospitais no Rio Grande do Norte. *Psicologia USP*, 13, 217-246.

Follicular waves in the human ovary

https://doi.org/10.56238/sevened2024.005-004

Karine Queiroz Poletto[1], Eduardo Camelo de Castro[2], Gabriella Reis de Barros Ribeiro[3] and Thaiz Brandão Cosac[4]

ABSTRACT

Follicular waves can be defined as a synchronized growth of a group of antral follicles, among which one or more follicles will be selected for subsequent development and ovulation. These waves occur at regular intervals during the menstrual cycle. The synchronization of the wave beginning and the ovarian stimulation improves the outcomes of the IVF treatment. Follicular waves are a natural phenomenon, and they develop in association with increased concentration of follicle stimulating hormone levels. Studies indicate that the follicular recruitment event occurs only once during the cycle; however, recent studies suggest that the recruitment can occur more than once during the same cycle. Several studies have demonstrated groups of women with two follicular waves and others with up to three waves during the normal menstrual cycle. Follicles recruited during these waves have the potential to ovulate in the presence of an luteinizing hormone surge, providing women, especially the poor responders, a more efficient and less expensive treatment. The majority of studies agree that there is not just a single wave of follicular recruitment during a menstrual cycle and this involves the optimization of treatment of poor responders, expanding the window of action for oocyte retrieval and avoiding expensive treatments.

Keywords: Ovarian follicle, Ovary, Ultrasonography, Follicular waves, Follicular dynamics.

[1] PhD; University of Gurupi UNIRG, Gurupi, Brazil;
E-mail: karinepoletto@unirg.edu.br
[2] PhD; Federal University of Goiás, Goiânia, Brazil;
[3] Medica graduated; Pontificia Catholic University of Goiás, Goiânia, Brazil;
[4] Medica graduated; Pontificia Catholic University of Goiás, Goiânia, Brazil.

INTRODUCTION

Reproduction is defined as a life process that allows the living organisms to produce descendants, giving continuity of the species. Originally, human reproduction was described by Hippocrates in the fifth century B.C. as the union of semen with the menstrual blood [1, 2]. Only in 1600, Graaf characterized the ovary as the egg producer, not differentiating the egg from the follicle, and in 1827, Baer individualized the ovarian follicle [2].

After these previous discoveries, the first studies on human folliculogenesis and on the menstrual cycle were performed based on histological and/or endocrinological evaluation of ovarian function [3, 4]. However, ovarian function during the menstrual cycle, as well as follicular growth and atresia, could only be evaluated after the development of transabdominal ultrasonography (USG) in the 1970s, improving dramatically with the transvaginal USG (TV USG) development in the 1980s [5, 6].

TV USG allowed visualization of antral follicles, up to approximately 2 mm, and evaluation of their growth and dynamics during menstrual cycle. Thus, the use of endocrinological, histological, and ultrasonography examinations made it possible to elucidate the antral follicle development, such as the observation of follicular waves during the menstrual cycle. These achievements provided the basis for assisted reproduction (AR) treatments [7, 8].

Treatment effectiveness in AR is mainly achieved by the induction of ovulation in order to increase the number of mature oocytes [9]. To do so, understanding the dynamics of follicular waves allows the recruitment and retrieval of good quality oocytes, a model known as Propitious Moment Theory. Therefore, it results in better fertilization rates, embryo development, and pregnancy [10].

STAGE DEFINITION: PRE-ANTRAL AND EARLY ANTRAL FOLLICLE DEVELOPMENT

Studies based on necropsy or oophorectomy samples estimate that human folliculogenesis from the primordial to the preovulatory phase lasts about 175 days [11].

In the fourth month of fetal life, follicular development begins [4]. At first, the primordial germ cells migrate from the endoderm to the gonads, where they undergo the first meiosis and become primary oocytes. The somatic cells of the primitive gonad involve the oogonium, forming rudimentary ovarian follicles (0.1 mm in diameter) [12]. The ovarian follicular reserve is formed by the oocytes in meiosis I and influences the reproductive potential of each woman. In the 20th week of gestation, there are approximately 7 million of these oocytes and after that they begin to reduce continuously in number throughout the life [4].

The pre-antral follicles (0.1–0.2 mm) develop independently of the action of gonadotrophins and when they reach 0.2–0.4 mm, a fluid-filled cavity begins to form and then they become responsive to gonadotrophins [12, 13].

Still in childhood, follicles develop until the early antral phase; however, due to the immaturity of the hypothalamic-pituitary-ovary axis, they stop evolving [14, 15]. From puberty complete maturity of the hypothalamic-pituitary-ovary axis, the antral follicles continue to develop and reach two or more millimeters in diameter [16, 17]. Visualization of follicles this size is currently possible through modern TV USG.

RECRUITMENT OF ANTRAL FOLLICLES

Antral or Graafian follicles are formed by the development of: a basement membrane between the granular cells and theca layers and the cumulus oophorus wherein the oocyte is located. The Graaf follicle ceases to be dependent on the follicle stimulating hormone (FSH) and begins to respond to the luteinizing hormone (LH), a characteristic necessary for being able to ovulate.

Throughout the menstrual cycle, the presence of antral follicles 2–5 mm in diameter is observed [18]. Three theories have been developed to explain the follicular recruitment during the menstrual cycle, advocating from continuous to cyclical development.

CONTINUOUS RECRUITMENT

Theory 1:

Histological studies in animals concluded that the early growth of antral follicles occurs continuously throughout the cycle period. Afterward, this theory evolved to explain the human menstrual cycle [19]. This theory proposes that antral follicles, smaller than or equal to 4–6 mm, are recruited continuously, independent of gonadotrophins, at all stages of reproductive life. Also, it postulates that the ovulatory follicle is chosen randomly, since they are at the optimum stage of maturity, being able to respond to increased levels of FSH and, subsequently, LH [20].

CYCLICAL RECRUITMENT

The appearance of a “follicular wave” at regular intervals during the menstrual cycle has been previously described [3, 18, 20, 21]. However, there are conflicting results in the literature regarding the number of these recruitments.

Theory 2—single follicular recruitment:

It postulates the single recruitment during the menstrual cycle of follicles 2–5 mm in size after the regression of the corpus luteum (CL), with decreasing levels of estradiol and inhibin and a transient increase of FSH in the late luteal or early follicular phase, which is known as the privileged phase [21]. It has been postulated that each follicle has an FSH threshold below which no recruitment occurs [22].

The recruited follicles contain low concentration of estradiol and high concentration of androgens [21]. Inhibin B produced by granulosa cells inhibits FSH secretion in the follicular phase [23]. Inhibin A, however, is low in the follicular phase and reaches maximal levels in the luteal phase, suggesting that CL is a source of inhibin A, which is produced to suppress FSH and prevent follicular development [21].

The anti-Müllerian hormone (AMH) is produced by the granulosa cells of the primary, secondary, pre-antral, and early antral follicles (≤4 mm). It inhibits follicular growth by decreasing sensitivity to FSH. However, the action of the AMH is not fully understood [24]

Theory 3—follicular waves:

The growth of a group of antral follicles at regular intervals during the menstrual cycle is defined as follicular wave. The follicles in each wave are of similar but not identical diameters [18]. Two waves have been detected: the first in the follicular phase and the second in the luteal phase. However, the luteal follicles presented fewer granulosa cells and lower levels of estradiol compared to the ones in follicular phase [3, 20]. In addition, those women with regular cycles of 30–35 days presented two follicular waves in contrast with a single follicular wave in women with cycles of 26–30 days [18].

In those women with two follicular waves, an anovulatory wave appeared at the time of ovulation (early luteal phase) followed by the wave of ovulation that developed in the early follicular phase. In women with three waves, an anovulatory wave arose at the time of ovulation and a second anovulatory wave emerged during the mid to late period of the luteal phase. The third wave, ovulatory, appeared at the beginning of the mid follicular phase [18].

An elevation of FSH precedes the recruitment of each follicular wave [18]. Inhibin B produced by the granulosa cells of the recruited follicles inhibits FSH secretion [23]. However, the precise action of inhibin A, inhibin B, and AMH on the appearance of multiple follicular waves in women is unclear [18].

In clinical practice, both oocyte recovery and successful in vitro maturation are observed with ovarian stimulation during the luteal phase, being considered as a procedure for urgent preservation of fertility. Otherwise, by using USG, the day of follicular wave emergence is considered when the largest follicle to be recruited among the follicle pool reaches a diameter of 4–6 mm [25]. The stimulation of ovulation during the luteal phase followed by stimulation of the follicular phase has also been advocated to reduce the time to pregnancy of poor responder patients.

FOLLICLE SELECTION

During the recruitment of follicles, only one follicle called “dominant” is selected for subsequent growth and ovulation, while the other follicles undergo atresia. This process is called “follicle selection” and usually occurs in the early-to-mid-follicular phase [3, 8, 11, 18, 23].

When the dominant follicle reaches a diameter of 10 mm, between days 6–9 of the follicular phase, it suppresses the growth of the other follicles of the same follicular wave and it also suppresses the appearance of a new follicular wave by inhibiting FSH secretion [8, 18, 26, 27]. During the course of follicular selection is observed a concentration variation and the role of some hormones, such as:

FOLLICLE-STIMULATING HORMONE (FSH)

A peak of FSH concentration levels occurs for initial follicular recruitment and, subsequently, a post-surge concentration decrease occurs, being necessary for selection of the dominant follicle [18, 23, 27–29]. The duration of the FSH peak above a critical threshold determines the number of dominant follicles selected from the recruited cohort for preferential growth, a concept known as FSH threshold/window/gate [30–33]. In contrast, if the FSH levels remain above the threshold for a short duration, there is a development of a single dominant follicle. However, if the duration of FSH peak persists, multiple dominant follicles are recruited at the same time, a fact observed during the ovarian stimulation therapy [31].

Regarding the differences among the dominant follicle and the other follicles, it was postulated that the dominant one contains more granulosa cells and FSH receptors, which increases sensitivity to FSH, even at low concentrations. Therefore, with the decrease of FSH levels, the dominant follicle continues to develop while the subordinates are not able to evolve and undergo degeneration by atresia. In this way, the smaller recruited follicles are the ones that undergo atresia first [18, 22, 23, 34–36].

ESTRADIOL

From the fifth to the eighth day of the menstrual cycle, the aromatase activity initiates in the granulosa cells of follicles larger than 6–8 mm and the dominant one produces higher levels of estradiol [37–40]. Thus, the fluid within the dominant follicle contains more estrogen than androgen, while the fluid within the subordinate follicles contains more androgen [14, 41–43].

The LH acts on the theca cells, stimulating the production of androgens that work as the substrate for the production of estradiol in the granulosa [33, 44, 45]. Estradiol, in its turn, promotes negative feedback on FSH secretion, contributing to its decreased levels during follicular growth [46]. After the secretion of estradiol, the LH receptors are expressed in the granulosa of the dominant

follicle, which makes it less dependent on FSH activity and more responsive to LH during the selection process [34, 47, 48].

TRANSFORMING GROWTH FACTOR-BETA (TGF-B)

The interplay between oocyte and cumulus cells regulates both folliculogenesis and oogenesis [49]. The TGF-β family includes inhibin, activin, follistim, TGF-β, and AMH, among others. These molecules present paracrine or autocrine functions that aim to regulate follicular development and oocyte maturation.

All recruited follicles produce inhibin B which acts to decrease FSH levels before the selection process [30, 46, 50]. Activin is produced by granulosa and its role in the follicle selection is not well elucidated; however, it has been proposed that a coordinated transition within the follicular fluid from inhibin B to inhibin A and from activin to follistatin is critical for the development of the dominant follicle [35, 36].

The follicular content of AMH gradually decreases during antral follicle growth until 8–10 mm, when it is close to selection, and remains low. While AMH level decreases, there is a rise in aromatase activity [51]. Finally, it is proposed that the differential exposure to these signaling molecules is one of the ways by which the dominant follicle increases sensibility to FSH.

INSULIN-LIKE GROWTH FACTOR (IGF)

The concentration of IGF increases in the dominant follicle at the time of selection and also stimulates the action of aromatase, estradiol, estrogen, and androgen production [52, 53]. Among the subordinate follicles, there is no response to IGF. Therefore, the steroidogenesis of theca and granulosa is inhibited and atresia occurs [52, 54].

LUTEAL INFLUENCES ON FOLLICLE SELECTION

It has been previously reported that the dominant follicles are recruited contralateral to the CL of the previous ovulation and that these follicles contain a greater amount of estradiol in relation to the follicles that have developed ipsilateral to CL [40]. However, it is postulated that follicle selection and ovulation occur randomly among the right and left ovaries [18, 55].

Follicle selection occurs in the initial or middle follicular phase; however, previous studies demonstrated that selection occurs more than once in the menstrual cycle, reinforcing the follicular wave theory [18, 21].

The role of CL in the regulation of follicular wave dynamics has been studied and no significant differences in CL size, life span, progesterone secretion, or estradiol secretion have been observed among women with two versus three follicular waves [56].

DEVELOPMENT OF PREOVULATORY FOLLICLES

After the late follicular phase, the dominant follicle continues its development process, reaching the preovulatory state between 16 and 29 mm [8, 11, 18, 57]. The ovulatory follicle grows about 1–4 mm per day, and may undergo variation in the days preceding ovulation [8, 21, 57, 59]. The preferential growth of the dominant follicle at this stage is related to increased aromatase activity and a rapid increase in estradiol-17b levels in the circulation and within the follicular fluid [18, 20, 40, 43, 58–60].

The improved response of the dominant follicle to gonadotrophins is mediated by the production of estradiol in its granulosa layer, expression of the LH receptor, and by continuous preovulatory growth [20, 23, 34, 43, 46–48].

The dominant follicle accounts for more than 90% of estrogen production in the preovulatory period [60]. Preovulatory follicle growth is related to both intra-ovarian and endocrine factors, and the increase in aromatase levels is inversely proportional to that of AMH in the follicular fluid [51].

Theca cells produce more androgens influenced by high levels of inhibin A, increasing the amount of substrate for estradiol secretion [36]. In contrast, granulosa cells express IGF-II mRNA in abundance, stimulating aromatase activity [61]. The estradiol peak has a positive feedback action in the hypothalamus stimulating the release of LH. The LH surge is, thereby, necessary to induce ovulation. From this stage, the dominant follicle presenting a high expression of LH receptors is prepared to respond to the LH secretion. Then, ovulation occurs about 24 hours after the LH surge [62].

The interaction between LH and EGF in the granulosa stimulates the expression of protein kinases 1 and 2, leading to the reduction of granulosa layer proliferation and estrogen synthesis. Also, cumulus expansion and progesterone secretion occur as a consequence of ovulation [63]. This is particularly important to reduce the time to pregnancy of poor responders and for oncology patients who need to initiate treatment immediately

REFERENCES

1. Short, R. (1977). The discovery of the ovaries. In S. Zuckerman & B. Weir (Eds.), *The Ovary* (2nd ed., pp. xx-xx). New York: Academic Press.

2. Cobb, M. (2006). *Generation: The Seventeenth Century Scientists who Unraveled the Secrets of Sex, Life and Growth*. New York: Bloomsbury Publishing.

3. Block, E. (1951). Quantitative morphological investigations of the follicular system in women: Variations in the different phases of the sexual cycle. *Acta Endocrinologica, 8*, 33-54.

4. Baker, T. (1963). A quantitative and cytological study of germ cells in human ovaries. *Proceedings of the Royal Society of London [Biological Sciences], 158*, 417-433.

5. Hackeloer, B., & Robinson, H. (1978). Ultraschalldarstellung des wachsenden follikels und corpus luteum im mormalen physiologischen zyklus [Ultrasound examination of the growing ovarian follicle and of the corpus luteum during the normal physiologic menstrual cycle]. *Geburtshilfe Fruenheilkd, 38*, 163-168.

6. Hall, D. A., Hann, L. E., Ferrucci, J. T. Jr., Black, E. B., Braitman, B. S., Crowley, W. F., et al. (1979). Sonographic morphology of the normal menstrual cycle. *Radiology, 133*, 185–188.

7. Andreotti, R. F., Thompson, G. H., Janowitz, W., Shapiro, A. G., & Zusmer, N. R. (1989). Endovaginal and transabdominal sonography of ovarian follicles. *Journal of Ultrasound in Medicine, 8*, 555-560.

8. Pache, T., Wladimiroff, J., Dejong, F., Hop, W., & Fauser, B. (1990). Growth patterns of nondominant ovarian follicles during the normal menstrual cycle. *Fertility and Sterility, 54*, 638-642.

9. Centers for Disease Control. (2005). *Assisted Reproductive Technology (ART) Report* (Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Division of Reproductive Health). Atlanta: Centers for Disease Control and Prevention.

10. Adams, G. P., & Jaiswal, R. (2008). Follicular dynamics in cattle: Historical overview and research update. *Acta Scientiae Veterinariae, 36*, S377-S396.

11. Gougeon, A. (1986). Dynamics of follicular growth in the human: A model from preliminary results. *Human Reproduction, 1*, 81-87.

12. Gougeon, A. (1979). Qualitative changes in medium and large antral follicles in the human ovary during the menstrual cycle. *Unknown Journal, 19*, 1461-1468.

13. Craig, J., Orisaka, M., Wang, H., Orisaka, S., Thompson, W., Zhu, C., et al. (2007). Gonadotropin and intra-ovarian signals regulating follicle development and atresia: The delicate balance between life and death. *Frontiers in Bioscience, 12*, 3628-3639.

14. Gougeon, A. (1996). Regulation of ovarian follicular development in primates: Facts and hypotheses. *Endocrine Reviews, 17*, 121-155.

15. Peters, H. (1979). The human ovary in childhood and early maturity. *European Journal of Obstetrics, Gynecology, and Reproductive Biology, 9*, 137–144.

16. Gougeon, A. (2004). Dynamics of human follicular growth: Morphologic, dynamic, and functional aspects. In P. Leung & E. Adashi (Eds.), *The Ovary* (2nd ed., pp. xx-xx). Amsterdam: Elsevier Academic Press.

17. Messinis, I. E. (2006). From menarche to regular menstruation: Endocrinological background. *Annals of the New York Academy of Sciences, 1092*, 49-56.

18. Baerwald, A., Adams, G., & Pierson, R. (2003). Characteristics of ovarian follicular wave dynamics in women. *Biology of Reproduction, 69*, 1023-1031.

19. Mandle, A., & Zuckerman, S. (1950). Numbers of normal and atretic oocytes in unilaterally spayed rats. *The Journal of Endocrinology, 6*, 426-435.

20. McNatty, K. P. (1981). Hormonal correlates of follicular development in the human ovary. *Australian Journal of Biological Sciences Society, 49*, 687–699.

21. Gougeon, A., & Lefevre, B. (1983). Evolution of the diameters of the largest healthy and atretic follicles during the human menstrual cycle. *Journal of Reproduction and Fertility, 69*, 497-502.

22. Fauser, B., & Van Heusden, A. (1997). Manipulation of human ovarian function: Physiological concepts and clinical consequences. *Endocrine Reviews, 18*, 71-106.

23. Van Santbrink, E., Hop, W., Dessel, T. V., Jong, F. D., & Fauser, B. (1995). Decremental follicle-stimulating hormone and dominant follicle development during the normal menstrual cycle. *Fertility and Sterility, 64*, 37-43.

24. Baerwald, A. R., Adams, G. P., & RA, P. (2012). Ovarian antral folliculogenesis during the human menstrual cycle: A review. *Human Reproduction Update, 18*, 73-91.

25. Demirtas, E., Elizur, S. E., Holzer, H., Gidoni, Y., Son, W. Y., Chian, R. C., et al. (2008). Immature oocyte retrieval in the luteal phase to preserve fertility in cancer patients. *Reproductive Biomedicine Online, 17*, 520-523.

26. Ginther, O. J., Bergfelt, D. R., Beg, M. A., & Kot, K. (2001). Follicle selection in cattle: Role of luteinizing hormone. *Biology of Reproduction, 64*, 197-205.

27. Adams, G. P., Matteri, R. L., Kastelic, J. P., Ko, J. C. H., & Ginther, O. J. (1992). Association between surges of follicle-stimulating hormone and the emergence of follicular waves in heifers. *Journal of Reproduction and Fertility, 94*, 177-188.

28. Roseff, S. J., Bangah, M. L., Kettel, L. M., Vale, W., Rivier, J., Burger, H. G., et al. (1989). Dynamic changes in circulating inhibin levels during the luteal-follicular transition of the human menstrual cycle. *The Journal of Clinical Endocrinology and Metabolism, 69*, 1033-1039.

29. Le Nestour, E., Marraoui, J., Lahlou, N., Roger, M., De Ziegler, D., & Bouchard, P. (1993). Role of estradiol in the rise in follicle-stimulating hormone levels during the luteal-follicular transition. *The Journal of Clinical Endocrinology and Metabolism, 77*, 439–442.

30. Gibbons, J. R., Wiltbank, M. C., & Ginther, O. J. (1997). Functional interrelationships between follicles greater than 4 mm and the follicle-stimulating hormone surge in heifers. *Biology of Reproduction, 57*, 1066-1073.

31. Schipper, I., Hop, S., & Fauser, B. (1998). The follicle-stimulating hormone (FSH) threshold/window concept examined by different interventions with exogenous FSH during the follicular phase of the normal menstrual cycle: Duration, rather than magnitude, of FSH increase affects follicle development. *The Journal of Clinical Endocrinology and Metabolism, 83*, 1292-1298.

32. Brown, J. B. (1978). Pituitary control of ovarian function: Concepts derived from gonadotrophin therapy. *The Australian & New Zealand Journal of Obstetrics and Gynaecology, 18*, 47-54.

33. Baird, D. (1987). A model for follicular selection and ovulation: Lessons from superovulation. *Journal of Steroid Biochemistry, 27*, 15-23.

34. Yamoto, M., Minami, S., Nakano, R., & Kobayashi, M. (1992). Immunohistochemical localization of inhibin/activin subunits in human ovarian follicles during the menstrual cycle. *The Journal of Clinical Endocrinology and Metabolism, 74*, 989-993.

35. Roberts, V. J., Barth, S., El-Roeiy, A., Yen, S. S. (1993). Expression of inhibin/activin subunits and follistatin messenger ribonucleic acids and proteins in ovarian follicles and the corpus luteum during the human menstrual cycle. *The Journal of Clinical Endocrinology and Metabolism, 77*, 1402-1410.

36. Schneyer, A. L., Fujiwara, T., Fox, J., Welt, C. K., Adams, J., Messerlian, G. M., et al. (2000). Dynamic changes in the intrafollicular inhibin/activin/follistatin axis during human follicular development: Relationship to circulating hormone concentrations. *The Journal of Clinical Endocrinology and Metabolism, 85*, 3319-3330.

37. Mikhail, G. (1967). Sex steroids in blood. *Clinical Obstetrics and Gynecology, 10*, 29-39.

38. Baird, D., & Fraser, I. S. (1975). Concentration of oestrone and oestradiol in follicular fluid and ovarian venous blood of women. *Clinical Endocrinology, 4*, 259-266.

39. McNatty, K. P., Baird, D. T., Bolton, A., Chambers, P., Corker, C. S., Mclean, H. (1976). Concentration of oestrogens and androgens in human ovarian venous plasma and follicular fluid throughout the menstrual cycle. *The Journal of Endocrinology, 71*, 77-85.

40. Chikazawa, K., Araki, S., & Tamada, T. (1986). Morphological and endocrinological studies on follicular development during the human menstrual cycle. *The Journal of Clinical Endocrinology and Metabolism, 62*, 305–313.

41. Westergaard, L., Christensen, I. J., & McNatty, K. P. (1986). Steroid levels in ovarian follicular fluid related to follicle size and health status during the normal menstrual cycle in women. *Human Reproduction, 1*, 227–232.

42. Mango, D., Scirpa, P., Spina, M. A., Battaglia, F., Tartaglia, E., Manna, P., et al. (1988). Ultrasonic and endocrinologic relationships in spontaneous and induced follicular phase. *Journal of Endocrinological Investigation, 11*, 7-13.

43. Van Dessel, H. J. H. M. T., Schipper, I., Pache, T. D., Geldorp, H. V., Jong, F. H. D., & Fauser, B. C. J. M. (1996). Normal human follicle development: An evaluation of correlations with oestradiol, androstendione and progesterone levels in individual follicles. *Clinical Endocrinology, 44*, 191-198.

44. Ryan, K. J. (1979). Granulosa-thecal cell interaction in ovarian steroidogenesis. *Journal of Steroid Biochemistry, 11*, 799-800.

45. Adashi, E. Y. (1994). Endocrinology of the ovary. *Human Reproduction, 9*, 815–827.

46. Ginther, O. J., Bergfelt, D. R., Kulick, L. J., & Kot, K. (2000). Selection of the dominant follicle in cattle: Role of estradiol. *Biology of Reproduction, 63*, 383-389.

47. Sullivan, M. W., Stewart-Akers, A., Krasnow, J. S., Berga, S. L., & Zeleznik, A. J. (1999). Ovarian responses in women to recombinant follicle-stimulating hormone and luteinizing hormone (LH): A role for LH in the final stages of follicular maturation. *The Journal of Clinical Endocrinology and Metabolism, 84*, 228-232.

48. Filicori, M. (2002). The potential value of mid-follicular phase LH. *Human Reproduction, 17*, 517–523.

49. Senbon, S., Hirao, Y., & Miyano, T. (2003). Interactions between the oocyte and surrounding somatic cells in follicular development: Lessons from in vitro culture. *The Journal of Reproduction and Development, 49*, 259-269.

50. Fraser, H. M., Groome, N. P., & Mcneilly, A. S. (1999). Follicle-stimulating hormone-inhibin B interactions during the follicular phase of the primate menstrual cycle revealed by gonadotropin-releasing hormone antagonist and antiestrogen treatment. *The Journal of Clinical Endocrinology and Metabolism, 84*, 1365–1369.

51. Nielsen, E., Rasmussen, I., Fukuda, M., Westergaard, L., & Andersen, C. (2010). Concentrations of anti-Müllerian hormone in fluid from small human antral follicles show a negative correlation with CYP19 mRNA expression in the corresponding granulosa cells. *Molecular Human Reproduction, 16*, 637-643.

52. Poretsky, L., Cataldo, N. A., Rosenwaks, Z., & Giudice, L. C. (1999). The insulin-related ovarian regulatory system in health and disease. *Endocrine Reviews, 20*, 535-582.

53. Giudice, L. C. (2001). Insulin-like growth factor family in Graafian follicle development and function. *Journal of the Society for Gynecologic Investigation, 8*, S26-29.

54. Hourvitz, A., Widger, A. E., Filho, F. L., Chang, R. J., Adashi, E. Y., & Erickson, G. F. (2000). Pregnancy associated plasma protein-A gene expression in human ovaries is restricted to healthy follicles and corpora lutea. *The Journal of Clinical Endocrinology and Metabolism, 85*, 4916–4920.

55. Ojha, K., Nargund, G., Sladkevicuis, P., & Scaramuzzi, R. J. (2000). Pulsed Doppler ultrasonography to assess follicular growth and the pattern of emergence of the dominant follicle and to determine ovarian follicular and stromal blood flow parameters in relation to follicular size. *Journal of Reproduction and Fertility, 45*, (Abstract Series) 25.

56. Baerwald, A. R., Adams, G. P., & Pierson, R. A. (2005). Form and function of the corpus luteum during the human menstrual cycle. *Ultrasound in Obstetrics & Gynecology, 25*, 498-507.

57. Renaud, R. L., Macler, J., Dervain, I., Ehret, M. C., Aron, C., Plas-Roser, S., et al. (1980). Echographic study of follicular maturation and ovulation during the normal menstrual cycle. *Fertility and Sterility, 33*, 272-276.

58. Bakos, O., Lundkvist, O., Wide, L., & Bergh, T. (1994). Ultrasonographical and hormonal description of the normal ovulatory menstrual cycle. *Acta Obstetricia et Gynecologica Scandinavica, 73*, 790-796.

59. Hackeloer, B. J., Fleming, R., Robinson, H. P., Adam, A. H., & Coutts, J. R. T. (1979). Correlation of ultrasonic and endocrinologic assessment of human follicular development. *American Journal of Obstetrics and Gynecology, 135*, 122-128.

60. Baird, D., & Fraser, I. (1974). Blood production and ovarian secretion rates of estradiol and estrone in women throughout the menstrual cycle. *The Journal of Clinical Endocrinology and Metabolism, 38*, 1009-1017.

61. Hernandez, E. R., Hurwitz, A., Vera, A., Pellicer, A., Adashi, E. Y., Leroith, D., et al. (1992). Expression of the genes encoding the insulin-like growth factors and their receptors in the human ovary. *The Journal of Clinical Endocrinology and Metabolism, 74*, 419-425.

62. Tsang, B. K., Moon, Y. S., Simpson, C. W., & Armstrong, D. T. (1979). Androgen biosynthesis in human ovarian follicles: Cellular source, gonadotropic control, and adenosine 3′,5′-monophosphate mediation. *The Journal of Clinical Endocrinology and Metabolism, 48*, 153-158.

63. Duggavathi, R., & Murphy, B. D. (2009). Ovulation signals. *Science, 324*, 890-891.

Profile of organ procurement for transplantation in a large state procurement center

https://doi.org/10.56238/sevened2024.005-005

Virginia Leonardi Dambros[1], Mariane Amado de Paula[2], Bruna Gidiel Paim[3], João Pedro Kremer Ferraz[4] and Rogério Fett Schneider[5]

ABSTRACT

Introduction: In Brazil, the scarcity of organs harvested for transplantation is a frustrating reality. There are several factors responsible for this situation. The present study aims to analyze the profile of organ harvesting at the Hospital de Pronto Socorro de Canoas (HPSC), Rio Grande do Sul State, Brazil. Methods: This was a retrospective cross-sectional study in a database. Data regarding organ procurement from donors admitted to the HPSC were evaluated, in addition to data from the State Organ Procurement Center, in the period between January 2016 and July 2023. The variables analyzed were gender, age, cause of death (traumatic or non-traumatic), organs harvested, time between the diagnosis of brain death and organ harvesting, and the need for vasoactive drugs and transfusions in the preoperative period of harvesting. Results: During the period analyzed, 158 organ harvests were performed for transplantation, 108 (68%) in male patients and 50 (32%) in female patients. The median age of the patients was 47 years (IQR: 26, 58); Traumatic causes of death accounted for 67% of the sample (n=106), while non-traumatic causes accounted for 33% of deaths (n=52), and stroke accounted for 23.4% (n=37) of total deaths. Conclusion: Regardless of the number of organs harvested, the kidneys are the most removed organs, followed by the liver and corneas. The numbers show that over the years, there have not been very expressive numbers of captures, which may be the result of a low awareness of the importance of organ donation.

Keywords: Organs, Transplantation, Death.

[1] Medical Student
Lutheran University of Brazil
E-mail: virginiadambros@rede.ulbra.br
[2] MSc in Medicine
Canoas Emergency Hospital
E-mail: mari.amadodepaula@hotmail.com
[3] Medical Student
Lutheran University of Brazil
E-mail: bruna.paim@rede.ulbra.br
[4] Doctor
Lutheran University of Brazil
E-mail: jpkferraz@hotmail.com
[5] Doctor
Canoas Emergency Hospital
E-mail: Schco@terra.com.br

INTRODUCTION

In Brazil, the scarcity of organs harvested for transplantation is a frustrating reality. There are several factors responsible for this situation, but the following should be highlighted: the difficulty of the care team in detecting brain death (BD) and correctly following the diagnostic protocol, which ends up making donation unfeasible; the population's lack of information about the procurement and transplantation processes, which interferes with the consent of the potential donor's family, limiting the number of transplants; the structural problems of the Brazilian Unified Health System.[1]

BD is defined as the complete and irreversible cessation of brain functions, making it impossible to maintain life without the aid of artificial means.[2] In Brazil, the diagnosis of BD is defined by CFM Resolution No. 1480/97. Initially, it is necessary to make sure that the patient has identification and hospital registration. The cause of the unresponsive coma must be known and established, the patient must not be hypothermic (axillary temperature < 35°C), must not be receiving Central Nervous System suppressive drugs, and must not be hypotensive (systolic blood pressure must be greater than or equal to 90 mmHg). Once these items are completed, the patient must undergo two neurological examinations, which must be performed by two different physicians, who are not members of the organ removal and transplantation team, to assess the integrity of the brainstem. The minimum time interval between one exam and another is six hours. In addition to the two clinical tests, it is also important to note that a complementary test is required to show the absence of cerebral electrical activity or cerebral metabolic activity or cerebral blood perfusion.[2]

The minimum aspects indispensable for the maintenance of the potential donor are: a) Maintain MAP > 65mmHg or SBP > 90mmHg; b) Initiate volume replacement with crystalloids if hypotension is present (20-30 ml/kg); c) Infuse vasoactive drugs (preferably noradrenaline) at the dose necessary to achieve BP target; d) Use vasopressin whenever vasopressors are indicated – continuous infusion at a dose of 0.5 to 2.4 U/h.[3] According to studies, early administration of vasopressin and noradrenaline optimizes hemodynamic support for BD patients.[4]

Regarding hematological support, it is necessary to: a) Transfuse red blood cells if Hb ≤ 7 g/dl for all patients; b) Transfuse red blood cells for patients with Hb between 7 and 10 g/dl, if hemodynamic instability with inadequate tissue perfusion; c) Transfuse platelets if active bleeding and thrombocytopenia; c) Transfuse fresh plasma if INR > 1.5 and high risk of bleeding, pre-invasive procedure, or active bleeding; d) Transfuse cryoprecipitate if fibrinogen < 100 mg/dl is associated with a high risk of bleeding, pre-invasive procedure, or active bleeding.[3]

The absolute contraindication to the use of organs from a potential donor occurs when the risk of transmission of a disease outweighs the possibility of benefit from potential organ recipients.[5] The main absolute contraindications are related to the transmission of some infectious and neoplastic conditions. In addition, there are risk factors that are considered absolute criteria for the exclusion of

tissue donors, due to the increased risk of disease transmission. Factors associated with behavior considered risky in the 12 months prior to donation (applicable to all tissues): use of injectable illicit drugs; engaging in sexual intercourse in exchange for money, with multiple partners, or by exposure to intercourse with partners known to be infected; and the practice of homosexual relations between men.[5]

Between 2016 and June 2023, 25,687 organ transplants were registered in Brazil, 1,741 of which were registered in Rio Grande do Sul.[5] The profile of donors at the state or national level is the same, with a predominance of males, in the age group of 50-64 years, with the most frequent cause of BD being stroke. (6) Even so, this is a small number when analyzing the demand needed to meet the waiting list. (6)

Thus, the present study aims to analyze the profile of organ harvesting at the Hospital de Pronto Socorro de Canoas (HPSC), Rio Grande do Sul State, Brazil.

METHODS

This was a retrospective cross-sectional study in a database. Data regarding organ procurement from donors admitted to the Emergency Hospital of Canoas (RS) were evaluated, in addition to data from the State Organ Procurement Center, in the period between January 2016 and July 2023. The variables analyzed were gender, age, cause of death (traumatic or non-traumatic), organs harvested, time between the diagnosis of brain death and organ harvesting, and the need for vasoactive drugs and transfusions in the preoperative period of harvesting.

RESULTS

During the period analyzed, 158 organ harvests for transplants were performed, 108 (68%) in male patients and 50 (32%) in female patients. The median age of the patients was 47 years (IQR: 26, 58); 10 patients (6.3%) were 11-17 years old; 47 (29.7%) were 18-34 years old, 30 (19%) were 35-49 years old, 48 (30.3%) were 50-64 years old, and 24 (14.7%) were older than 65 years old. Traumatic causes of death accounted for 67% of the sample (n=106), while non-traumatic causes accounted for 33% of deaths (n=52), and stroke accounted for 23.4% (n=37) of total deaths.

Following the chronological order (Figure 1), in 2016 there were 32 captures (20%), in 2017 there were 18 (11%), in 2018 there were 19 (12%), in 2019 there were 14 (9%), in 2020 there were 13 (8%), in 2021 there were 23 (14%), in 2022 there were 26 (16%) and in the first seven months of 2023 there were 13 captures (8%).

In the sample analyzed, 158 patients donated their organs for transplantation. In 21 patients (13%), only one organ was harvested, two organs were harvested in 68 patients (43%), three organs in 36 patients (23%), and four or more organs in 28 patients (18%). In 5 patients (3%) of the sample,

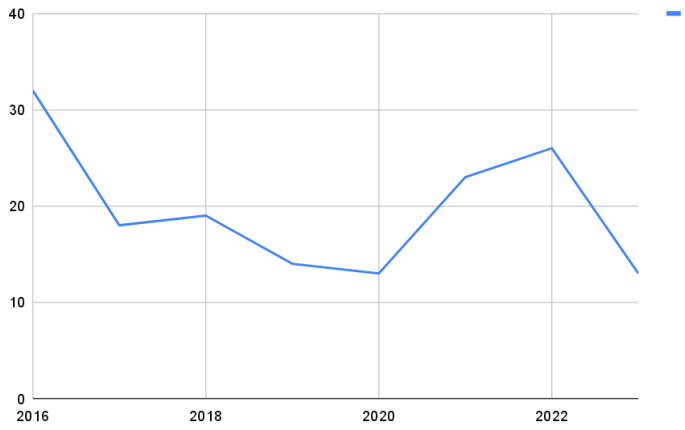
there were no data in the medical records on uptake; therefore, they were not accounted for in the analysis.

In cases where only one organ was harvested, 90% were kidneys and 10% liver. In the cases of harvesting two organs, 97% were kidneys, 85% liver, 9% corneas, 6% skin, 1% heart and 1% lungs. In the harvesting of three organs, 100% were kidneys, 67% liver, 58% corneas, 39% skin, 19% lungs, 14% heart and 3% pancreas. Finally, in the harvests of four or more organs, 100% were kidneys and liver, 82% corneas and skin, 25% lungs, 11% heart, 7% pancreas, and 3% intestine and spleen.

Regarding the preoperative prescription of vasoactive drugs (VAD) and blood components, some vasoactive drug option was administered to 101 patients (63%) of the sample. In 54 patients (34.2%), no vasoactive drug was used. Transfusion of blood components was performed in 23 patients (14.6%) of the sample, while 132 patients (83.5%) did not receive blood components. No information was found on transfusion of blood components and administration of VAD in 3 patients (1.8%).

Regarding the time between BD protocol closure and capture, a mean of 11.8 hours (h) was obtained, with a standard deviation of 4.1 h. The time between BD and capture that lasted 5 hours or less represented 7% of the sample (n=11), 14% (n=22) took between 6 and 8 hours, 38% (n=60) lasted 9 and 12 hours, and 39.1% (n=62) of the sample took more than 12 hours. A total of 3 patients (1.85%) were excluded from the calculation due to lack of information in the medical records.

Figure 1: Number of organ harvests per year



DISCUSSION

The profile of the donors of the hospital in question is in line with the national and state profiles, being represented, for the most part, by men in the age group of 50-64 years. On the other hand, differently from the Brazilian profile, because the present study was conducted through the database of a trauma hospital, traumatic causes are the main mechanism of evolution to BD, even

though stroke represented a significant portion of deaths. The year with the highest number of funding was 2016, and a significant drop was subsequently noted in the following four years, having increased in 2021, where it is possible to perceive a trend towards gradual growth. It can be seen that a significant portion of the patients received preoperative VAD, however, it is taken into account the fact that the study was carried out in a trauma hospital, in which the patients usually have a similar profile, with hemodynamic instability, requiring VAD to stabilize the condition. Likewise, the use of blood components is widely used in cases of emergency due to trauma to maintain blood volume, and has been the treatment of a small portion of patients.

CONCLUSION

Regardless of the number of organs harvested, the kidneys are the most removed organs, followed by the liver and corneas. The numbers show that over the years, there have not been very expressive numbers of captures, which may be the result of a low awareness of the importance of organ donation.

REFERENCES

1. Marques, S. H. B., Cézaro, P. D., Soares, D. C., & Azeredo, N. S. G. de. (2007). RESULTADOS DA COMISSÃO INTRA-HOSPITALAR DE DOAÇÃO DE ÓRGÃOS E TECIDOS PARA TRANSPLANTE (CIHDOTT) DO HOSPITAL CRISTO REDENTOR DE PORTO ALEGRE. *bjt*, 10(2), 721-724. Disponível em: https://bjt.emnuvens.com.br/revista/article/view/332

2. Brasil. (2017). *Lei n° 2173 de 23 de novembro de 2017. Define os critérios do diagnóstico de morte encefálica*. Brasília, DF. Diário Oficial da União.

3. Paraná. Secretaria de Estado da Saúde do Paraná. Sistema Estadual de Transplantes. (2018). *MANUAL PARA NOTIFICAÇÃO, DIAGNÓSTICO DE MORTE ENCEFÁLICA E MANUTENÇÃO DO POTENCIAL DOADOR DE ÓRGÃOS E TECIDOS*. Curitiba: SESA/SGS/CET.

4. Fonseca, B. S., Souza, V. S., Batista, T. O. F., Silva, G. M., Spigolon, D. N., Derenzo, N., & Barbieri, A. (2021). Estratégias para manutenção hemodinâmica do potencial doador em morte encefálica: revisão integrativa. *einstein (São Paulo)*, 19, eRW5630. https://doi.org/10.31744/einstein_journal/2021RW5630

5. Westphal, G. A., Garcia, V. D., Souza, R. L. de, Franke, C. A., Vieira, K. D., Birckholz, V. R. Z., et al. (2016). Diretrizes para avaliação e validação do potencial doador de órgãos em morte encefálica. *Rev bras ter intensiva*, 28(3), 220–255. https://doi.org/10.5935/0103-507X.20160049

6. Associação Brasileira de Transplantes. (2023). *Dimensionamento dos Transplantes no Brasil e em cada estado 2016-jun 2023*. São Paulo - SP. Disponível em: <https://site.abto.org.br/conteudo/rbt/>

Clinical and surgical considerations in pregnant women: Multidisciplinary approach to obstetric complications

https://doi.org/10.56238/sevened2024.005-006

Carlos Walmyr de Mattos Oliveira[1], Solange Mendes Vieira[2], Luís Carlos de Paula e Silva[3], Ramon Henrique Avanci[4], Flávio Roberto Gravetz[5], Barbara Yanaisa Castellanos Rodriguez[6], Rolando Gutierrez Rosales[7], Pedro Henrique Pereira da Silva Alves[8], Rebeca da Silveira Ferreira[9], Allan Maia de Jesus[10], Yasmim Priscilla Gomes de Jesus[11] and Carlos Augusto Portela[12]

ABSTRACT

This study provides a comprehensive analysis of the physiological adaptations and obstetric complications associated with pregnancy, emphasizing their clinical and practical relevance. Throughout the gestational period, the female body undergoes significant changes in various systems, including cardiovascular, respiratory, gastrointestinal, and hematological, all aimed at supporting fetal development and ensuring maternal well-being. These adaptations include an increase in blood volume and a condition of hypervolemia, as well as changes in heart rate and lung ventilation, along with a reduction in gastrointestinal motility. The clinical implications of these adaptations are thoroughly discussed, highlighting the importance of employing advanced imaging techniques for fetal diagnosis and monitoring, while also addressing common obstetric complications such as appendicitis and postpartum hemorrhage. In conclusion, a profound understanding of these physiological changes is crucial to ensure a healthy and safe pregnancy, guiding healthcare professionals in the provision of high-quality obstetric care and the minimization of potential complications.

Keywords: Physiological Adaptations, Pregnancy, Obstetric Complications, Ultrasonography, Diagnosis.

[1] Doctoral student in Clinical Research in Infectious Diseases Institution: National Institute of Infectious Diseases Evandro Chagas/Fiocruz
[2] Pediatric Resident in NeuropediatricsInstitution: Hospital Federal de Servidores do Estado do Rio de Janeiro
[3] Dr. in Public Health
Institution: Faculty of Medicine of Marília - Famema
[4] Nurse, Oncology Specialist
Institution: Faculdade Anhanguera
[5] Intensive Care Specialist
Institution: UFPR Clinical Hospital Complex
[6] First Degree Specialist in Comprehensive General Medicine
Institution: Faculty No. 2 of Medicine
[7] General Surgeon – Prerequisite in Basic Surgical Area
Institution: Regional Hospital of Ceilândia - DF
[8] Undergraduate student in MedicineInstitution: Centro Universitário UNIFGE
[9] Undergraduate student in MedicineInstitution: Pontifical Catholic University of Goiás
[10] Graduating in Medicine
Institution: Institute of Medical Education - IDOMED
[11] Undergraduate student in Medicine
Institution: Institute of Medical Education - IDOMED
[12] Graduating in Medicine
Institution: Lutheran University of Brazil - ULBRA

INTRODUCTION

Pregnancy is a period of complex and significant physiological changes in a woman's body, which aims to sustain fetal development and ensure an environment conducive to pregnancy [1]. During this period, a number of adaptations occur in various body systems, including the cardiovascular, respiratory, gastrointestinal, renal, and urinary system, to meet the metabolic demands of both mother and fetus[1,2].

The fundamental aspect of physiological adaptations during pregnancy lies in the transformations observed in the cardiovascular system [3]. These changes include a substantial increase in blood volume, accompanied by modifications in heart rate, ensuring an adequate supply of oxygen and nutrients to the developing fetus [2, 4]. In addition, respiratory adaptations, such as increased minute volume and expansion of thoracic diameters, facilitate maternal-fetal gas exchange, while gastrointestinal changes, such as reduced motility, can impact the gastrointestinal comfort of pregnant women [1,4].

However, these adaptations are not without challenges. During pregnancy, women are subject to obstetric and medical complications, such as appendicitis, cholelithiasis, intestinal obstruction, and hepatic complications, which can pose risks to both mother and fetus [5]. The diagnosis and management of these conditions during pregnancy require a careful and differentiated approach, considering the physiological changes inherent to this period [6].

In this context, it is crucial to understand the mechanisms underlying physiological adaptations during pregnancy, as well as the complications that may arise and their respective clinical approaches. This article seeks to explore in detail the cardiovascular, respiratory, gastrointestinal, renal, and urinary adaptations during pregnancy, as well as provide insights into the diagnosis and management of common obstetric complications. By understanding these aspects, health professionals can improve the quality of care provided to pregnant women, ensuring a healthy and safe pregnancy for both mother and baby [3].

METHODOLOGY

The search was conducted from September 2023 to February 2024 across several biomedical databases, including PubMed, Scopus, and Google Scholar. We used a combination of pertinent search terms, such as "complications during pregnancy", "physiological changes in pregnancy", "appendicitis in pregnancy", "cholelithiasis during pregnancy", "intestinal obstruction during pregnancy", "ovarian masses in pregnant women", among others. There was no restriction on language or date of publication during the selection of studies.

Initially, relevant articles were identified through electronic databases and by consulting specialized books on obstetrics and maternal-fetal medicine. After applying the exclusion criteria,

which included duplicate studies, articles that were not directly related to medical complications during pregnancy, animal studies, and studies published before 2000.

Inclusion criteria included studies that addressed aspects related to medical complications during pregnancy in humans, including experimental and observational studies, systematic reviews, clinical guidelines, and case reports. During data collection, relevant information was extracted about the different medical complications during pregnancy, including etiology, clinical manifestations, differential diagnosis, diagnostic and therapeutic strategies, as well as management and surgical approaches when applicable.

Data were analyzed qualitatively to identify patterns, trends, and gaps in the literature related to medical complications during pregnancy. The most relevant findings were highlighted and key points were synthesized to provide a comprehensive overview of the different conditions studied. Importantly, this study is a literature review and did not involve the collection of primary patient data, so no ethical review was required.

LITERATURE REVIEW

During pregnancy, between 0.1% and 2.2% of pregnant women may require surgical intervention due to physiological changes in the mother and fetus, in addition to increased uterine volume and displacements of maternal organs, which can complicate both the diagnosis and the therapeutic approach [5]. These changes are accompanied by significant alterations in several body systems, thus affecting the physiology of pregnant women [1].

CARDIOVASCULAR ADAPTATIONS DURING PREGNANCY

During the gestational period, the mother's body undergoes remarkable adaptations in its cardiovascular system to sustain fetal development and ensure an environment conducive to pregnancy [2, 4]. One of the most notable aspects is the significant increase in blood volume, ranging from 45% to 50% and reaching its peak at the end of gestation [1]. This increase is driven in part by placental hormones, which stimulate the production of red blood cells, resulting in an increase of about 20% in red blood cell mass [2, 4]. This phenomenon causes a thinning of the blood, leading to anemia considered normal during pregnancy and characterizing a state of hypervolemia, with an increase in blood volume [1]. In addition, the pregnant woman's heart rate begins to increase in the 7th week of pregnancy, and can increase by about 20% in relation to pre-pregnancy values at the end of pregnancy [1, 4]. These adaptations are crucial to ensure adequate supply of nutrients and oxygen to the developing fetus, while meeting the physiological demands of the mother during this period [5].

During pregnancy, there is a reduction in systemic vascular resistance by about 20%, which results in a decrease in systolic and diastolic blood pressures throughout most of gestation, followed

by a gradual recovery to pre-pregnancy levels [2]. However, this phenomenon can also increase pressure in the venous system, compromising venous return from the lower extremities and potentially causing edema [1, 7]. These adaptations are essential to ensure an adequate blood supply to the developing fetus while meeting the physiological needs of the mother during pregnancy [7].

RESPIRATORY SYSTEM IN PREGNANCY

During pregnancy, significant adaptations occur in the respiratory system [2]. There is an increase in minute volume (amount of air ventilated per minute), while functional residual volume (volume of air that remains in the lungs after a maximal expiration) decreases [2]. Contrary to the initial intuition that lung volume could decrease during pregnancy, an increase in pulmonary ventilation is actually observed [1].

This phenomenon is facilitated by the expansion of the anterior and posterior diameters of the thorax, thus increasing minute ventilation (total air that the lungs receive or exhale in one minute) [2]. These changes induce compensated respiratory alkalosis, characterized by a partial pressure of carbon dioxide (PcO_2) ranging from 28 to 35 mmHg during pregnancy, while the partial pressure of oxygen (Po_2) remains equal to or greater than 100 mmHg [8].

Additionally, both oxygen consumption and basal metabolic rate increase by around 20% during this period [8]. These physiological changes lead to a lower lung reserve in pregnant women facing acute diseases, reducing the time needed for respiratory distress to progress to respiratory failure [6,9]. Therefore, early intervention in these cases is crucial.

GASTROINTESTINAL CHANGES DURING PREGNANCY

Throughout pregnancy, it is common to observe a reduction in gastrointestinal motility in pregnant women [4]. This decrease is the result of both mechanical changes, due to the increase in uterine volume, and smooth muscle relaxation, induced by the high levels of progesterone characteristic of this period [2]. As a consequence, gastric emptying can be delayed for up to 8 hours, leading pregnant women to be considered as having a functionally full stomach constantly [4]. In addition, reduced intestinal motility can result in significant constipation, causing severe abdominal pain [6]. These changes are common during pregnancy and can affect the gastrointestinal comfort of pregnant women.

COAGULATION, RENAL FUNCTION, AND URINARY TRACT

During pregnancy, the body undergoes a number of significant changes that affect blood clotting, kidney function, and the urinary system [7]. One of these alterations is the hypercoagulable state, characterized by an increase of about 30% in the levels of fibrinogen, a protein crucial in blood

clotting [9]. This condition increases the risk of complications such as deep vein thrombosis and pulmonary embolism, especially in situations of prolonged rest or immobilization [6]. It is essential that these risks are closely monitored and properly managed to ensure the health of the mother and fetus [1].

In addition, pregnancy results in a significant increase, approximately 50%, in blood flow to the renal pelvis [4]. This leads to an increase in the glomerular filtration rate, contributing to the frequent need to urinate observed in pregnant women [4,6]. As a result of this increase in blood flow and glomerular filtration, blood creatinine levels decrease by about 40% compared to pre-pregnancy levels [8]. Therefore, it is crucial for healthcare providers to consider these changes when assessing kidney function during pregnancy, ensuring accurate diagnoses and appropriate care.

In addition, ureteral changes are also noticeable during pregnancy, with a significant increase in ureter diameter [1]. This is mainly due to the compression exerted by the growing uterus and the relaxation of the smooth muscles, which delays peristalsis and facilitates urinary reflux from the bladder to the lower ureter [7,8]. These changes increase the risk of pyelonephritis among pregnant women, highlighting the importance of proactive treatment for asymptomatic bacteriuria in order to prevent severe complications [6].

USE OF IMAGING TECHNIQUES DURING PREGNANCY

Among the imaging techniques available, ultrasonography stands out as the safest and most widely used approach during pregnancy [1,7]. In addition to being used to evaluate the fetus, ultrasonography is also valuable in investigating the causes of abdominal pain [1]. As the procedure of choice, ultrasonography plays a crucial role in confirming the presence of intrauterine pregnancy, allowing a detailed evaluation of various structures [1,5]. These include the cul-de-sac (for detecting fluid), ureters (for dilation or stones), gallbladder (for identification of stones), and placenta (for abnormalities) [5].

Magnetic resonance imaging (MRI) also emerges as a safe option during pregnancy, and there is no evidence of increased risks for the fetus [5]. Its use is frequent in the diagnosis of fetal anomalies, especially those related to the central nervous system [5].

Although there are theoretical concerns about exposure to ionizing radiation, most diagnostic radiographic procedures present minimal or no risk to the fetus [10]. Studies indicate that there is no significant increase in the risk of congenital malformations, growth restriction, or miscarriage in procedures that expose the fetus to doses up to 5 rads[5,10].

Guidelines established by the American College of Obstetrics and Gynecology in 1995 corroborate this perspective, reassuring women about the performance of clinically necessary diagnostic tests, emphasizing maternal well-being as a priority [5]. It is essential to emphasize that

diagnostic tests should be requested in order to provide an accurate and timely diagnosis, thus ensuring the health of both mother and fetus [10].

CLINICAL EVALUATION OF ABDOMINAL PAIN DURING PREGNANCY

The clinical evaluation of abdominal pain during pregnancy represents a significant challenge for health professionals [5]. Although it is natural to associate most abdominal pain with the gestational process, it is crucial to remember that other medical conditions can occur in pregnant women as often as in the general population [1]. In addition, it is necessary to consider the specific conditions of pregnancy in the differential diagnosis [4]. Abdominal pain during pregnancy can have a variety of causes, from those directly related to the development of the fetus to preexisting or new medical conditions [4]. Therefore, a broad and detailed approach is essential to ensure an accurate and timely diagnosis [1].

Healthcare professionals should be aware of warning signs that may indicate serious conditions, such as placental abruption, appendicitis, cholecystitis, or ectopic pregnancy [11]. In addition, it is important to consider the patient's individual risk factors, medical history, and any previous obstetric complications [5]. A complete evaluation of abdominal pain during pregnancy should include a detailed physical examination, analysis of symptoms reported by the patient, monitoring of vital signs, and, when necessary, the use of imaging techniques such as ultrasound or magnetic resonance imaging [6].

A multidisciplinary approach, involving obstetricians, gynecologists, radiologists, and other specialists, may be instrumental in ensuring a comprehensive evaluation and proper management of abdominal pain during pregnancy [5,11]. By taking a careful and diligent approach, healthcare providers can provide the best possible care for expectant mothers, ensuring the safety of both mother and fetus [5].

APPENDICITIS IN PREGNANCY: DIAGNOSTIC CHALLENGES AND CLINICAL CONSIDERATIONS

Appendicitis is a worrisome surgical complication that can occur during pregnancy, affecting approximately two in every thousand pregnant women, with an incidence similar to that of the general population [9]. An intriguing feature is the variation in the position of the appendix as the uterus expands during pregnancy [9, 11]. Although the appendix shifts upwards, characteristic right lower quadrant pain remains the most common symptom, regardless of gestational stage [5, 9].

Diagnosing appendicitis in pregnant women can be a challenging task due to the overlap of common pregnancy symptoms, such as abdominal pain, nausea, and vomiting [11]. These symptoms can be easily confused with other typical conditions of pregnancy, such as round ligament pain and

hyperemesis gravidarum [9]. In addition, the presence of mild leukocytosis, frequently observed during pregnancy, may contribute to diagnostic confusion [9]. Thus, it is crucial for health professionals to be aware of other signs and symptoms that may help in the differentiation and correct diagnosis of these conditions [1, 11].

Symptoms such as fever and anorexia can serve as useful indicators to help establish the diagnosis of appendicitis during pregnancy [5]. Although ultrasonography is a valuable tool, its value may be limited in cases of intestinal distension, making it necessary to use more advanced imaging techniques, such as non-contrast computed tomography (CT), in more complex situations [10].

Rupture of the appendix during pregnancy poses a serious risk to the health of both mother and fetus, especially after 20 weeks of gestation [5]. The resulting peritonitis can significantly increase the risk of preterm labor and preterm delivery [9]. Therefore, it is essential that the diagnosis of appendicitis be established early and that surgical intervention be performed immediately in order to avoid serious and potentially fatal complications for the mother and baby [5].

CHOLELITHIASIS

After appendicitis, biliary tract diseases are the most common surgical complications encountered during pregnancy [5]. Cholelithiasis, usually caused by obstruction of the cystic duct, may present with intermittent bouts of biliary pain or with persistent pain radiating to the subscapularis area in cases of obstruction of the common bile duct due to calculus [5,11]. Ultrasonography is a useful tool to detect the presence of gallstones [10].

The differential diagnosis includes other conditions such as liver pain, HELLP syndrome, and severe preeclampsia [5,12]. Conservative treatment may be attempted initially, but persistence of symptoms may require surgical intervention [5,13]. Postponement of surgery may increase perinatal morbidity, although laparoscopic cholecystectomy may be considered in early pregnancies [5,11]. Although rare, pancreatitis can occur during pregnancy, with cholelithiasis being the most common cause [14]. However, it can also be a complication of severe preeclampsia or HELLP syndrome5 [, 13].

BOWEL OBSTRUCTION IN PREGNANCY: CRUCIAL RECOGNITION AND INTERVENTION

Bowel obstruction during pregnancy is not an uncommon occurrence, with an incidence that resembles that of the general population [5]. Patients often manifest characteristic symptoms, such as abdominal cramps accompanied by exacerbated peristalsis [9]. Nausea and vomiting are complaints present in about 80% of cases, while abdominal distention is prominent [1, 5]. It is extremely important to perform a surgical intervention before intestinal necrosis or perforation occurs, as the occurrence of the latter during pregnancy is associated with a significant increase in morbidity and mortality for both the mother and the fetus [5,11].

OVARIAN MASSES IN PREGNANCY: IMPORTANCE OF EARLY RECOGNITION AND PRESERVATION OF THE CORPUS LUTEUM

With the spread of ultrasound in early pregnancy, detection of the gestational corpus luteum has become a common occurrence [5]. Generally, this finding is physiological in nature and, in the absence of torsion symptoms, only requires follow-up for diagnostic confirmation [14].

Progesterone production in the first 14 weeks of gestation plays a crucial role in maintaining pregnancy until placental progesterone production replaces it [2, 8]. Therefore, if surgical intervention is required due to symptoms of torsion or bleeding, it is critical to make every effort to preserve the corpus luteum during the first trimester of gestation [5, 13].

PLACENTAL ABRUPTION: CHALLENGES IN DIAGNOSIS AND MANAGEMENT

Diagnosing obstetric complications that result in pain can be a significant challenge. The use of ultrasonography has limitations, since only a small percentage (5% to 10%) of placental abruptions are visualized [5,10]. However, early identification of placental abruption is of paramount importance [5]. In many cases, these abruptions are related to uterine hypertonicity, which can trigger fetal heart rate abnormalities [1, 4].

Placental abruptions often occur in the third trimester of pregnancy, often characterized by acute and severe abdominal pain [1]. Contrary to popular belief, the presence of vaginal bleeding is not always evident in cases of placental abruption [5]. Therefore, it is imperative that healthcare professionals make a rapid and accurate diagnosis of this complication, even in the absence of vaginal bleeding [1, 5].

It is important to consider the role of trauma as a potential risk factor for placental abruption, with distinct mechanisms involved [14]. Direct blunt trauma to the uterus, such as assaults or the impact of the seat belt in accidents, can result in injuries to the site of implantation of the placenta 11. In addition, rapid acceleration and deceleration, which is common in automobile accidents, can lead to lateral force injuries [11]. Even in the absence of visible physical lesions, the adrenergic response to stress can trigger uterine vasospasm, culminating in ischemic necrosis at the implantation site and formation of subplacental hematoma [5].

Pregnant women who experience trauma should be closely monitored for at least 4 hours, with the possibility of prolonged monitoring for up to 24 hours [5]. Placental abruption can quickly progress to a surgical emergency, requiring immediate delivery [5]. In addition to clinical examination, laboratory studies such as platelet count and fibrinogen may be useful in diagnosis, especially for occult cases, as the expansion of the retroplacental hematoma can consume coagulation factors, aggravating the situation [5,14].

HEPATIC COMPLICATIONS IN PREGNANCY: ESSENTIAL RECOGNITION AND APPROACH

HELLP syndrome and acute fatty liver of pregnancy are conditions that can manifest with right upper quadrant pain, accompanied by nausea and vomiting [12]. HELLP syndrome, a severe form of preeclampsia, should not be confused with cholelithiasis or other gastrointestinal diseases [13]. The progression of these hepatic complications can result in hepatic capsule rupture and maternal mortality if the diagnosis is not made accurately and in a timely manner [5].

The diagnosis of these conditions is largely based on laboratory studies, which play a crucial role in identification and monitoring [6]. Tests such as LDH, AST, platelet count, creatinine, uric acid, and hematocrit determinations are fundamental [1, 7]. Elevations in AST and LDH levels, along with a decrease in platelet count and an increase in hematocrit, are common, especially when associated with intravascular volume depletion [5, 6].

In addition, patients with acute fatty liver may present with hypoglycemia [6]. It is critical for clinicians to take into account the physiological changes of pregnancy when interpreting these laboratory results [7]. A careful approach and a deep understanding of the nuances of these conditions are essential to ensure proper diagnosis and treatment, helping to prevent serious and potentially life-threatening complications for both mother and fetus [6].

TRAUMA DURING PREGNANCY: PROPER ASSESSMENT AND MANAGEMENT

Trauma due to accidents is an occurrence in about 6% to 7% of all pregnancies, carrying not only the risk of placental abruption, but also increasing the likelihood of preterm labor and rupture of membranes before term [5]. It is of paramount importance that pregnant women who are victims of trauma are comprehensively evaluated for a wide range of injuries, following protocols similar to those applied to non-pregnant patients [9,14].

Studies have shown an increased risk of fetomaternal hemorrhage in women who have undergone trauma during pregnancy [5,15]. Those who are RhD-negative should undergo a quantitative assessment of the volume of fetal cells in the maternal circulation, followed by appropriate administration of anti-immunoglobulin D to prevent sensitization of the maternal immune system [1,5]. It is noteworthy that peritoneal lavage is not contraindicated in pregnancy and can be safely performed in patients with suspected visceral rupture [5].

The multidisciplinary approach and the consideration of pregnancy-specific risks are essential to ensure the safety of the mother and fetus after trauma during pregnancy [15]. Careful follow-up and early intervention are essential to minimize complications and optimize clinical outcomes for both parties involved [15].

OBSTETRIC PROCEDURES: APPROACH AND MANAGEMENT OF COMPLICATIONS IN CESAREAN DELIVERY

The most common obstetric procedure is surgical delivery, also known as cesarean section [16]. This procedure often involves a vertical infraumbilical incision in the midline, especially in obese patients or when rapid entry into the abdominal cavity is required [5]. After placement of a bladder tube, entry into the peritoneal cavity is performed with cross-section of the peritoneum of the vesicoterin fold and careful dissection of the bladder from the lower uterine segment [9].

The transverse uterine incision is then made, centered at the midline, and extended as needed [9]. This is followed by rupture of the membranes and the birth of the fetus, with the application of fundal pressure to facilitate the process [11]. It is important to note that, although the Pfannenstiel incision is commonly used, variations in the technique may be necessary depending on the specific clinical situation, such as the need for rapid entry into the abdominal cavity or the presence of certain anatomical conditions of the patient [5]. These variations are adapted to ensure the safety of both mother and baby during the procedure [5].

In cases of transverse or pelvic presentation, a low vertical incision is preferred, starting in the lower uterine segment towards the bladder and, if necessary, extending cranially to avoid fetal entrapment [9,11]. Although less common, classic cesarean section with incision on the anterior and upper parts of the uterine fundus can be performed in cases of obstruction of the lower uterine segment due to uterine fibroids or very preterm pregnancies [14].

After the baby's birth, the closure of the uterine incision can be aided by the exteriorization of the uterine fundus, also facilitating uterine massage [5]. Intravenous administration of oxytocin is recommended to help with uterine contraction [5]. The uterine incision is closed with absorbable sutures, with a second layer imbricated for hemostasis, if necessary [9]. The abdomen is inspected for bleeding, and the abdominal wall is closed according to standard procedure [5].

It is possible that bleeding may be triggered when assisting a patient with postpartum hemorrhage [14]. Therefore, it is important to recognize factors that may be peculiar to pregnancy. Blood volume increases during pregnancy [8]. Hemorrhage in pregnancy is defined as blood loss beyond 1,000 ml [5]. It should be noted, however, that due to the increase in blood volume at term, the patient may lose 1,500 to 2,000 ml before symptoms [9]. The most common cause of postpartum hemorrhage is uterine atony [9]. Risk factors for uterine atony include prolonged labor, uterine infection, surgical delivery, and hyperdistension of the uterus [11]. Hemorrhage may also occur in placental abruption and in patients with placenta previa, either before or after delivery. It is recommended that therapy be initiated after loss of 600 ml [11].

The first step is to screen for vaginal, cervical, or uterine lacerations [5]. If the test is negative and the mechanism is compression of the uterus, an external uterine massage should be performed

and 10 units of oxytocin should be administered in a 1-liter bag of intravenous fluid [5, 11]. Oxytocin should be administered slowly, at a rate not exceeding 200 ml/h [6, 11]. If there is no response to oxytocin, administration of an alternative uterotonic agent such as methylergonovin or carboprostaglandin 5 should be considered. In addition, an internal uterine massage can be performed by placing the hand inside the uterus and compressing it against the spine [16]. If these measures fail, consideration should be given to exploring the uterus manually to remove clots or retain placental fragments [9]. If hemorrhage persists, uterine arterial embolization or ligation of the hypogastric arteries may be necessary [9].

The epidural spine can be a valuable tool in the treatment of postpartum hemorrhage, as it can provide an effective sympathetic blockade [5]. If all conservative measures fail, it may be necessary to perform an emergency hysterectomy to control the hemorrhage and save the patient's life [9]. It is important that the medical team is prepared for these eventualities and has the necessary resources available to intervene quickly and ensure the best possible outcome for both mother and baby [14].

The first step is to screen for vaginal, cervical, or uterine lacerations [5]. If the test is negative and the mechanism is uterine atony, manual exploration of the uterus should be initiated to ensure complete removal of the placenta and aggressive uterine massage should be initiated [9]. If this is unsuccessful, administration of an oxytocin solution, 20 units per liter of saline, at a rate of 200 ml/h, may assist with uterine [contractility6,11]. A rate of up to 500 ml can be administered in 10 minutes without significant cardiovascular complications; however, maternal hypotension may occur with an intravenous bolus injection as low as 5 units [5, 6].

When oxytocin does not produce an adequate response, synthetic prostaglandin 15-methyl-F2α (Carboprost) should be administered intramuscularly or into the uterine wall [5, 6]. In addition, methylergonovine, 0.2 mg, can be administered intramuscularly [5]. Methylergonovine is contraindicated in patients with hypertension [5]. Prostaglandin F2α is contraindicated in patients with asthma [5]. Misoprostol (Cytotec) also has uterotonic properties and can be used at a dose of 1,000 µg rectally [11].

When pharmacological measures fail to control hemorrhage, surgical measures should be adopted [9]. If the hemorrhage is secondary to uterine atony, ligation of the uterine vessels may be successful [5]. The first step in the ligation of the uterine arteries is at the level of the anastomosis of the uterine and ovarian arteries in a high position at the bottom, immediately below the utero-ovarian ligament [9, 14]. A suture can be made with an atraumatic needle from the uterus, surrounding the vessel, which will be tied [9].

If bilateral ligation of utero-ovarian vessels does not stop bleeding, temporary atraumatic occlusion of the ovarian arteries in the infundibulopelvic ligaments can be attempted [5]. Due to a decrease in perfusion pressure, thrombosis in the vascular bed can produce hemostasis [14]. If

conservative measures are unsuccessful, a hysterectomy may have to be performed before sequelae of coagulopathy and hemorrhagic shock occur [5]. In the case of postpartum hemorrhage, supracervical hysterectomy is the procedure of choice [9].

As in the gynecological hysterectomy already described, the upper fixations of the uterus are isolated, but after ligation of the uterine arteries, the fundus of the uterus is amputated from the cervix, which is closed with eight-shaped stitches [5, 9]. This procedure also maintains the integrity of the uterosacral ligaments [5]. It is difficult to remove the cervix, especially after vaginal delivery secondary to dilation of the lower uterine segment [9]. Only surgeons skilled in this procedure should proceed without a request for consultation [9].

REPAIR OF EPISIOTOMIES AND COMPLICATIONS: SURGICAL APPROACHES AND STRATEGIES TO PREVENT RECTOVAGINAL FISTULAS

In exceptional circumstances, it may be necessary for a surgeon to intervene to repair an episiotomy and its possible complications [9]. Episiotomy is an incision in the perineal body performed during childbirth, usually in the midline, from the posterior commissure of the vulva towards the rectum, in order to facilitate the birth process [5, 9]. Although these incisions provide greater comfort to the patient, in some cases, they may extend beyond what is expected, reaching the anal sphincter (third degree) or even the rectal wall (fourth degree) [14]. An inadequate repair can result in the development of a rectovaginal fistula, which shares similar symptoms to rectal fistulas associated with Crohn's disease, but is usually simpler to repair and has a lower recurrence rate [5, 9].

The repair process of an episiotomy involves the reapproximation of the vaginal and perineal tissues [5]. In case of anal sphincter involvement, it is necessary to identify and reapproach the fascial capsule, which commonly retracts posteriorly [11]. If the rectal wall is compromised, a multi-layered closure using 2-0 or 3-0 absorbable suture for the mucosa, muscles, rectovaginal fascia, and anal sphincter, in addition to the vaginal and vaginal mucosa muscles, will provide a better chance of preventing the development of a fistula [9,11]. Due to the increase in vascularity associated with pregnancy, adequate closure without inducing tissue necrosis through the stitches should not present any problems [5].

RESULTS AND DISCUSSION

The present study investigated the physiological adaptations and complications associated with the cardiovascular, respiratory, gastrointestinal, renal, urinary and hepatic systems during pregnancy, as well as the relevant diagnostic and therapeutic approaches. The results provided important insights into the complexities of these processes and the need for a multifaceted approach to ensure maternal and fetal well-being [5, 11, 15]. The cardiovascular adaptations observed, including a

significant increase in blood volume and heart rate, corroborate previous findings in the literature [2,8]. Hypervolemia and elevated heart rate are essential to ensure an adequate supply of nutrients and oxygen to the fetus, highlighting the importance of these changes in the maintenance of pregnancy [1].

Changes in the respiratory system, such as increased minute volume and reduced functional residual volume, are crucial to meet the increased metabolic demands during pregnancy [1, 2, 8]. Understanding these adaptations is critical for the effective management of potential respiratory complications and for ensuring adequate oxygenation for both mother and fetus [1, 4]. Reduced gastrointestinal motility and delayed gastric emptying are common phenomena during pregnancy, often associated with abdominal discomfort [1, 4, 6]. Early identification of these changes and the implementation of appropriate management strategies are essential to improve gastrointestinal comfort and avoid further complications [5,15].

The hypercoagulable changes observed during pregnancy increase the risk of thromboembolic complications, highlighting the importance of surveillance and appropriate management of these hemostatic disorders [5,6]. In addition, renal and urinary adaptations are essential to maintain the fluid and electrolyte balance of the mother and fetus, emphasizing the need for regular monitoring of renal function [2, 7, 8]. Ultrasonography has emerged as a crucial tool for the evaluation of the fetus and for the diagnosis of obstetric complications [10].

Magnetic resonance imaging has also been shown to be a safe option in certain cases, providing additional information on fetal anomalies [5, 6]. Understanding the risks and benefits of these imaging modalities is essential to guide appropriate clinical decisions during pregnancy [10]. The assessment of abdominal pain during pregnancy presents unique challenges due to the overlap of common pregnancy symptoms and preexisting medical conditions [1, 4]. Early identification of warning signs and consideration of specific characteristics of pregnancy are essential for accurate differential diagnosis and effective management of abdominal pain [1, 5].

The diagnosis of appendicitis during pregnancy can be complex due to the overlap of common pregnancy symptoms [5, 11]. Awareness of atypical presentation patterns and the implementation of early diagnosis strategies are crucial to avoid serious complications [5]. Biliary tract diseases, such as cholelithiasis, represent frequent complications during pregnancy, requiring a careful approach and individualized management strategies [5,9]. Early recognition and appropriate treatment of hepatic complications are essential to prevent maternal and fetal morbidity [5].

Bowel obstruction during pregnancy poses significant risks to the mother and fetus, requiring early surgical intervention to avoid serious complications [5]. Early recognition of symptoms and prompt intervention are essential to ensure better clinical outcomes [9]. Early recognition and proper management of ovarian masses during pregnancy are essential to ensure maternal and fetal health [9].

Preservation of the corpus luteum during the first trimester of pregnancy is essential to maintain pregnancy until placental progesterone production is established [5].

Trauma during pregnancy poses significant risks to the mother and fetus, requiring comprehensive assessment and appropriate management strategies [9]. Early recognition and aggressive treatment of associated complications are essential to minimize maternal and fetal morbidity and mortality [5,9]. Surgical delivery, such as cesarean section, is a common intervention during pregnancy, requiring a careful approach and an appropriate surgical technique to ensure better maternal and neonatal outcomes [9, 11, 16].

Recognition and proper management of complications, such as postpartum hemorrhage, are crucial to avoid further morbidity and mortality [5]. Taken together, the results of this study highlight the importance of comprehensively understanding the physiological adaptations and complications associated with pregnancy, as well as implementing effective diagnostic and management strategies to ensure maternal and fetal well-being. This information is critical to guide clinical practice and improve obstetric outcomes in pregnant women.

CONCLUSION

The present study offered a comprehensive analysis of the physiological adaptations and complications associated with pregnancy, highlighting the importance of regular monitoring and a multidisciplinary approach to ensure maternal and fetal well-being.

By reviewing cardiovascular, respiratory, gastrointestinal, renal, urinary, hepatic, and other adaptations, we were able to elucidate the complexity of these processes and their clinical relevance. Cardiovascular adaptations, including hypervolemia and increased heart rate, are essential for adequate supply of nutrients and oxygen to the fetus, while respiratory changes aim to meet increased metabolic demands.

Gastrointestinal and urinary changes also play key roles in maintaining fluid and electrolyte balance during pregnancy. However, pregnancy can also be accompanied by medical complications such as appendicitis, cholelithiasis, bowel obstruction, and trauma, requiring a careful approach and specific management strategies to ensure better clinical outcomes.

In addition, obstetric procedures, such as cesarean sections, require appropriate surgical technique and prompt recognition of potential complications. The use of imaging techniques, such as ultrasound and MRI, plays a crucial role in the early diagnosis of fetal anomalies and obstetric complications, allowing for timely interventions and improved maternal and neonatal outcomes.

Thus, this study underscores the importance of continuing medical education and the development of up-to-date clinical guidelines for the effective management of the complexities associated with pregnancy. By better understanding physiological adaptations and potential

complications, healthcare providers can provide safer and more effective care to pregnant women, ensuring a positive experience during pregnancy and childbirth.

REFERENCES

1. Cunningham, F., et al. (2020). Williams Obstetrícia. 25ª Ed. Rio de Janeiro: Grupo GEN.

2. Guyton, A. C., Hall, M. E., & Hall, J. E. (2021). Tratado de fisiologia médica. 14ª Ed. Rio de Janeiro: Grupo GEN.

3. Lima, M. R. G., et al. (2017). Alterações maternas e desfecho gravídico puerperal na ocorrência de óbito materno. Cad Saude Colet; 25(3), 324-331. https://www.scielo.br/j/cadsc/a/pXY7LxmDQVtW53wvFLpsYbv/?lang=pt

4. Klaus, M. H., et al. (2020). Tratado de Neonatologia de Fanaroff e Martin. 11ª Ed. Rio de Janeiro: Elsevier.

5. Sabiston, D. C., et al. (2019). Sabiston tratado de cirurgia: a base biológica da prática cirúrgica moderna. 20ª ed Rio de Janeiro - RJ: GEN Guanabara Koogan.

6. Kasper, D. L., et al. (2017). Medicina interna de Harrison. 19ª ed. Porto Alegre: AMGH Editora.

7. DeVita, V. T., Rosenberg, S. A., & Lawrence, T. S. (2023). Cancer: Principles & Practice of Oncology. 12ª ed. Rio de Janeiro: Wolters Kluwer Health.

8. Silverthorn, D. U. (2016). Fisiologia Humana. 7ª ed. Porto Alegre: AMGH Editora.

9. Minter, R. M., & Doherty, G. M. (2017). CURRENT: cirurgias e procedimentos. 14ª Ed. Porto Alegre- RS: Artmed.

10. Rocha, A. P. C., et al. (2020). Avaliação por imagem de condições não obstétricas na gestação: o que todo radiologista deve saber. Radiol Bras. 53(3), 185–194. https://www.scielo.br/j/rb/a/4kTmHNZKbWZz3CX79hjGCHg/?format=pdf&lang=pt

11. Zollinger, R. M., & Ellison, E. C. (2013). Atlas de cirurgia. 9ª ed. São Paulo - SP: Guanabara Koogan.

12. Nery, I. S., et al. (2014). Perfil epidemiológico e obstétrico de gestantes com síndrome HELLP. Cogitare Enfermagem, 19(1), 149-154. https://revistas.ufpr.br/cogitare/article/view/35973/22426

13. Krebs, V. A., et al. (2021). Síndrome de HELLP e mortalidade materna: uma revisão integrativa. Revista Brasileira de Revisão em Saúde. 4(2), 6927-6311. https://ojs.brazilianjournals.com.br/ojs/index.php/BJHR/article/view/26920

14. Marques, R. G. (2005). Técnica operatória e cirurgia experimental. 1ª Ed. São Paulo- SP: Guanabara Koogan.

15. Matos, M. G. (2021). Violência Obstétrica e Trauma no Parto: O Relato das Mães. Psicologia: Ciência e Profissão, 41, 1-13. https://www.scielo.br/j/pcp/a/XSKSP8vMRV6zzMSfqY4zL9v/

16. Boerma, T., et al. (2018). Global epidemiology of use of and disparities in caesarean sections. Lancet, 39(10155), 1341-1348. https://pubmed.ncbi.nlm.nih.gov/30322584/

Benefits of nurse-performed oncology patient navigation: An integrative review

https://doi.org/10.56238/sevened2024.005-007

Bruna dos Santos Durães de Paula[1], Fernanda Pereira da Silva[2], Karina Pereira Gomes[3], Alice Rodrigues Ramos[4] and Mariana Rodrigues da Silva de Menezes[5]

ABSTRACT

Patient navigation is a way to guide the patient throughout the health system, in this way, he will have a trained and reference professional so that he can guide him in all the steps that are necessary. Objective: To report the benefits of nursing navigation to cancer patients. Method: Integrative review of the literature. Results: 5 articles were selected from the BdENF, LILACS and PUBMED databases. The elaboration of a navigation program based on George Washington's model for Brazil resulted in a model that can be widely used in all spheres of the Unified and Complementary Health System. In this sense, this adaptation was able to adapt the needs of patients to the reality of cancer care in Brazil. In addition, 2 instruments were created to guide patients about their treatment. These are the informative and the Patient's Diary, which has become a means of health education for both the patient and their families, thus making it possible to have access to everything related to the disease and its treatment. In addition, it was noticed that in order to achieve results in patient navigation, it is necessary for these nurses to be aware of the skills they need to have, since the professional will be responsible for directing and caring for them. Conclusion: Nursing navigation is a little-known care model, but it is very effective in the treatment of cancer patients. In addition to helping patients and families navigate the health system and learn about their disease, it enables the improvement of their emotional state, bringing more confidence, hope and willingness to continue treatment. It is necessary to emphasize the importance of implementing this care in hospital settings today.

Keywords: Nurse, Patient Navigation, Oncology Nursing.

[1] Highest academic degree: PhD student in Bioethics at the postgraduate program in Bioethics at the University of Brasília - Unb, CNPQ productivity scholarship holder.
Current institution: Unb
E-mail: marianasilva333@gmail.com
[2] Education: Nursing undergraduate
Institution: Udf
[3] Education: Nursing undergraduate
Institution: Udf
[4] Education: Nursing undergraduate
Institution: Udf
[5] Education: Nursing undergraduate
Institution: Udf

INTRODUCTION

Patient navigation was a program developed in 1990 by the American physician Harold Freeman, together with the *American Cancer Society* (ACS), with the aim of guiding, instructing and facilitating the diagnosis process of a patient, throughout the health system in its line of care3. The *Pacient Navigator* program was created to guide cancer patients with the objective of facilitating access to care, and thus reducing treatment and eliminating the difficulties faced throughout the process, having an agile service centered on the patient and families.[1-2-6 years]

Previously, patient navigation was performed by lay volunteers and health professionals, but over time there was a need for specialized professionals1-2. In this sense, in 2009 the *Academy Of Oncology Nurse Navigator* (AONN) developed competencies for the performance of Nurse Navigators (EN), which guide the professional in their function, differentiating themselves within the Nursing category. Thus, according to AONN, it is up to the navigator to coordinate care; be communicative; be aware of the services available; identify potential barriers and address them; participation in the implementation of care, in addition to helping in decision-making with the multidisciplinary team and implementation of action plans for the improvement of this patient.[5-6 years]

In this sense, it is noted that EN is an exclusive support, with quality and benefits, because the journey of a cancer patient is very difficult, in which he must make decisions that can completely change his life, in view of all the emotional fragility2-4-5 . Patients and family members need adequate support to cope with the diagnosis, prognosis and end of treatment1-4-5. Communication between nurses, patients and family members has beneficial effects for good treatment, such action allows this patient to be navigated both in the Complementary System and in the Unified Health System (SUS), collaborating to alleviate the challenges in the practice of care2-3 .

According to Pautasso FF et al. (2017)[2] the implementation of this program in Brazil may result in a differential in the care of cancer patients. Thus, due to the fragmentation of the health system, there is a delay in treatment, impacting on the patient's suffering, therefore, it is necessary to navigate care in all its integrality, from the discovery to treatment.[2]

According to Rodrigues Rl et al (2021), the nurse navigator is responsible for maintaining the continuity of care6-3. Thus, it is important to observe what benefits will be offered to the patient. Therefore, the objective of this article was to report the benefits of nursing navigation to cancer patients.

METHOD

This is an integrative review of the navigation of cancer patients carried out by nurse navigators. This review is an instrument of Evidence-Based Practice (EBP), in which the research question that guided this review was: what are the benefits of nursing navigation for cancer patients?

There was a problematization of the theme, literature searches and critical evaluation, in addition to the presentation of the synthesis of knowledge. In this way, it is broad, as its generated knowledge can be applied in practice. The databases that were used: Nursing Database (BdENF), Latin American and Caribbean Health Sciences Literature (LILACS), *Medical National Library of Medicine* through the United States National Library portal (PUBMED), journals published between the years 2018 and 2023, with the search period between August 24 and 27, 2023.

The key words found through the descriptors in Health Sciences (DeCS/MeSh) were: nurse; patient navigation; Oncology Nursing. Thus, the descriptors were used in the databases, as shown in Chart 1.

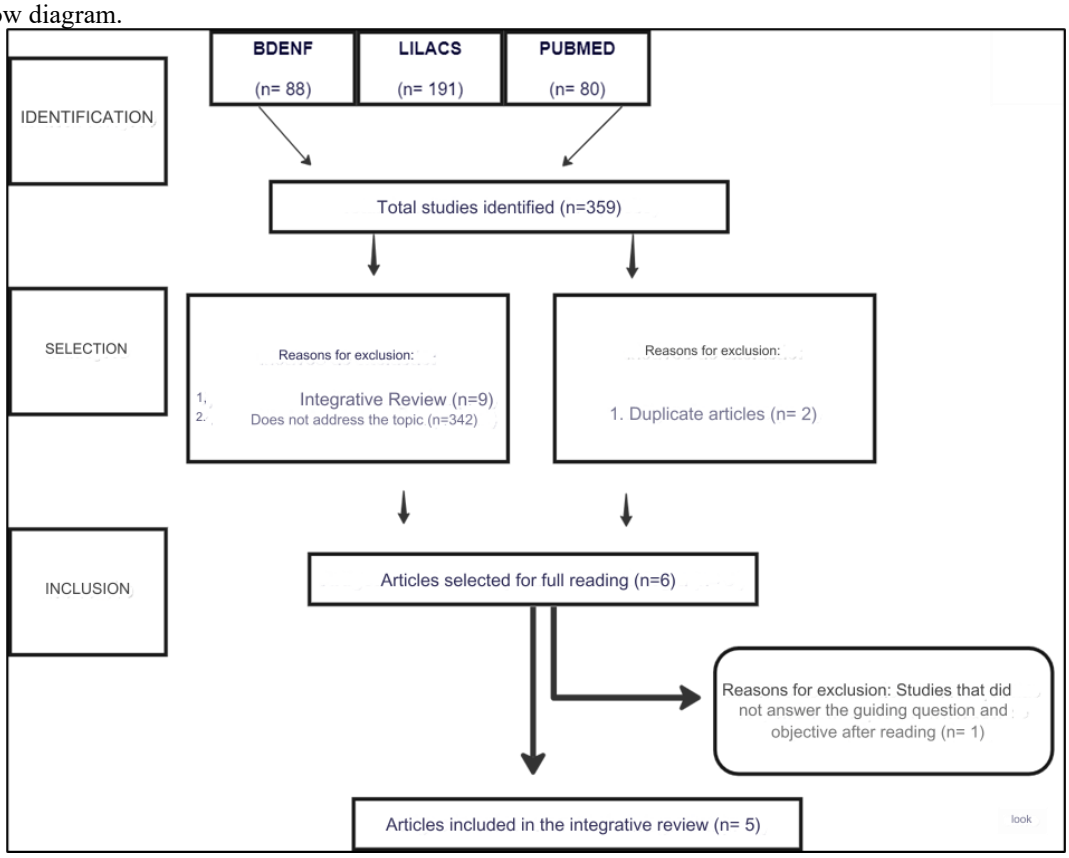
Table 1. Database search strategy

BDENF	((*Nursing*)) and ((*Patient Navigation*)) or ((*Oncology Nursing*))
PUBMED	((Nursing)) and ((Patient Navigation)) and (Oncology Nursing)
LILACS	((Nursing)) and ((Patient Navigation)) or ((Oncology Nursing))

Source: Own, 2023

In this sense, the inclusion criteria were journal articles: in the Portuguese, English and Spanish languages, and articles related to the theme. Exclusion criteria: articles that do not answer the guiding question, theses, dissertations, pamphlets, duplicate studies, integrative reviews.

Figure 1 – Flowchart of crossings, results of searches in the databases and the reasons for exclusion, adaptation of the Prisma Flow diagram.



Source: The author, 2023

RESULTS

From the selection mode, articles were selected below where they were placed in the box with author/year of publication, objective, type of study and results.

Author/ year of publication	Objective	Type of Study	Results
Silva TCMS, Castro MCN, Popim RC. 2018	To adapt the content of the *Nursing Activities Score* (NAS) instrument for the care of cancer patients.	Methodological research	This instrument will make it possible to measure the workload of the Oncology Nursing team, and may contribute to a new direction, new dimensions of personnel. Diagnosing a high level of complexity in the areas of spiritual care and biopsychosocial care.
Yackzan S, Stanifer S, Barker S, Blair B, Vidro A, Weyl H, Wheeler P. 2019.	To evaluate the effect with ONN (Oncology Nursing Navigation) contact on patient satisfaction.	Retrospective review	Mean scores and percentile classification comparisons (a common method of comparing data in statistics) were higher in groups where there was contact with the Oncology Nursing Navigators. The maximum scores were significantly higher in items such as: nurses' concerns, patients' doubts and concerns, and the team's sensitivity to the difficulties and inconveniences caused by the treatment.
Silva LCA, Mr. C, Pilati ACL, Dalfollo BR, Oliveira DR. 2019.	To propose a model of orientation to cancer patients about chemotherapy treatment, through a printed newsletter and the creation of a "patient diary".	Excerpt from an exploratory research, of the action research type	In order to involve the patient in their treatment, a new workflow was created after meetings with nurses in the sector and the needs of the unit. A newsletter called "patient diary" and guidance on adverse effects related to your treatment.
Pautasso FF, Lobo TC, Flores CD, Caregnato RCA. 2020.	Develop a Navigation Program for cancer patients, based on the model proposed by *The GW Cancer Institute* at *George Washington University*, adapted to the reality of a High Complexity Oncology Center	Convergent applied care research.	In the Navigation Program, planning and implementation occurred simultaneously, creating a design in the basic formatting of this program and its processes, in which patients with head and neck cancer were also included in the program. The purpose of the Navigation Need Assessment Scale was to select and enter patients into the Program, determining the recommended support. This evaluation had a consensus index of 96.42%, whose stages occurred through the adapted *Plan/Do/Check/Act* cycle .

Trajano R A, Alves LL, Almeida EPC, Decanio LCS, Whitaker MCO, Amaral JB, 2022.	To report the experience of oncology nurses navigators in the implementation of organizational actions to maintain patient care during the COVID-19 pandemic.	Experience report, developed between March and July 2020, using Situational Strategic Planning.	There were 4 stages: 1st – Decrease in the number of patients in diagnostic services, change in the routine of patients undergoing cancer treatment, and increased exposure to the virus. 2nd stage – Objectives were set to maintain the service, reduce doubts about the pandemic, and establish safety measures. 3rd stage – Actions to maintain early diagnosis and therapeutic routines, identification of signs and symptoms of COVID-19 and safety actions aimed at reducing exposure to the virus. 4th stage – Actions carried out as challenges to be overcome: the difficulty of telemonitoring, access to exams through digital platforms and as an innovation the "*drive – thru*" service.

DISCUSSION

According to the supporting literature, it is necessary that the professional who will perform patient navigation should be a nurse or an academic, depending on the level of reception that will be provided7. In this way, the authors noted that it is important to have basic features and a profile for browsers. In this sense, it can be seen that the patients will be the ones who will benefit directly, since the action of the navigators will result in beneficial effects to them. Such characteristics are: carrying out therapeutic plans; promote the elimination of barriers; work on health education so that patients have an understanding of their health-disease status; monitor the treatment together with the multidisciplinary team, collaborating in decision-making, among others. Therefore, it is notorious that the patient will be well assisted and instructed during his treatment, as he will have the support not only of his family members, but will also have a professional who will be his reference7.

The elaboration of a navigation program based on *George Washington*'s model for Brazil resulted in a model that can be widely used in all spheres of the Unified and Complementary Health System. Thus, it is clear that coordinated patient-centered care associated with guidance and information plays an important role from diagnosis discovery to treatment7.

According to Resolution No. 210/1998 of the Federal Council of Nursing (COFEN)[10], it is the responsibility of the nurse of the chemotherapy service to promote and disseminate measures to prevent risks and injuries through the education of clients and family members, aiming to improve the quality of life of the client. It also states that it is the nurse's role to "develop therapeutic nursing protocols for the prevention, treatment and minimization of side effects in clients undergoing antineoplastic chemotherapy treatment"[10], as well as "To provide comprehensive care to clients and their families, based on the Code of Ethics for Nursing Professionals and current legislation"[10].

Therefore, thinking about access to information, treatment and reception of patients, 2 instruments were created to guide patients about their treatment8. These are the informative and the

Patient's Diary, which has become a means of health education for both the patient and their families, thus making it possible to have access to everything related to the disease and its treatment. The information is delivered at the beginning of the treatment to guide and explain the effects and function that each chemotherapy therapy presents to the patient, (since the reactions will also occur when at home) and can be updated when necessary8.

The Patient Diary was created aiming at the personal side of the patient, working as a means of venting, as the patient will take it home and if any doubt arises regarding the treatment, chemotherapy or any other question, it should be written down and delivered at the next appointment in which the nurse will read and answer correctly. It will also record answers to questions related to the patient's daily state8. In addition, at each follow-up visit, an outpatient nurse will be responsible for reviewing the diary and checking if there are any doubts or questions noted while at home, and new orientations will be provided from that moment on8.

Thus, it is understood that the patient starts to understand his disease, being aware of all the stages and processes, becoming more relieved and involved, avoiding an overload and absence of possible information, enabling the creation of a bond with health professionals and consequently making his treatment something light and understandable8.

A tool was created to assist and guide the patient in their treatment process, and it is up to the outpatient nurse to monitor this instrument throughout the patient's consultation8. In this sense, the *Nursing Activities Score* (NAS) points out the overload of the work performed by the health professional, studies carried out[10] adapted this Score within oncology, where specialists from various multiprofessional areas linked to direct and indirect care, such as the research ethics committee of the Botucatu college and Judges, carried out a method with two rounds of opinions, i.e., an instrument to validate the workload of professionals who deal with cancer patients in intensive care units10.

In this way, they understood that the *feedback* from the nursing teams on quality measures of cancer patients results in positive perceptions about the patients, but a negative perception in relation to the burden such as the well-being and performance of these professionals. This perception positively influences the measurement of the workload of these professionals, contributing to the improvement of these professionals and the improvement of planning, avoiding stress and contributing to better professional care10.

Such instruments created by the authors8 can be used as a work tool by the nurse who will perform the navigation instead of being the outpatient nurse, considering that the professional has other duties in care. Thus, it is notorious that navigation should be performed with dedication exclusively by the nurse navigator, because according to the NAS, the nurse himself already has an overload of work, because in addition to administrative tasks, he has complete patient care, such as

bedside monitoring, support and care for family members and patients, ventilatory support, and cardiovascular support10.

In order to achieve results in patient navigation, it is necessary for these nurses to be aware of the skills they need to have, since they will be responsible for directing and caring for them. During the SARS-CoV-2 (COVID 19) pandemic, strategies were implemented so that cancer patients did not abandon treatment[9].

Thus, with the help of Situational Strategic Planning, a method created by a Chilean economist Carlos Matus in 1970, which has 4 stages: Explanatory, Normative, Strategic and Tactical Operational to face challenging and problematic situations; they developed some plans in two outpatient clinics and in a hospital, being strategic such as: the creation of the *drive-thru* for injectable medication, COVID testing before chemotherapy treatments, telecare consultations, home care, and scheduling appointments at an exact time and with a 1-hour interval between one patient and another9.

In this sense, it was observed that they brought confidence in patients and recognition of the importance of the nurse navigator's role in adapting and innovating with even individual strategies for diagnoses and continuation of safe treatment with planning and execution of emergency actions9.

In addition, other studies11 were conducted with outpatients from the *Press Ganey*, evaluating the development and satisfaction of cancer patients in contact with oncology nurses and patients without this assistance. In this sense, surveys and questionnaires were applied, which allowed the evaluation of the main factors that corroborate the efficiency of the treatment. Some surveys and questionnaires were used through some items of:

> [...] emotional needs addressed, kept the family informed about what to expect, sensitivity to difficulties and inconveniences, inclusion in treatment decisions, home care instructions, nurses' concern with questions and concerns, quality of care received from the nurse, explained what to expect during radiotherapy, explanation of the management of radiotherapy side effects, waiting time from the call to the first scheduled appointment, coordinated care between physicians and caregivers, care provided in this unit, likelihood to recommend services.[11]

It was observed that patients accompanied by a navigator had a higher satisfaction compared to patients who did not obtain care from a navigator. In view of all the research, it is worth emphasizing the importance of effective health education, so that the patient has an improvement in the quality of life and ensures the best possible treatment. In addition, the professional should demonstrate trust, demonstrating responsibility to bring comfort and safety to the patient throughout the process11.

FINAL THOUGHTS

It is concluded that patient navigation is a treatment model in the area of oncology in which it is little seen, practiced and currently known in Brazil. It is considered that this new work model is totally necessary in the treatment of cancer patients, due to its numerous benefits. The care provided to patients shows a significant improvement not only in their clinical conditions, but also in their view related to treatment and disease.

Patient-centered care enables easy access to the healthcare system and relevant information from the beginning to the end of treatment. It is noted that the patients are more willing to accept and continue with the treatment, since the Nurse Navigator will be available exclusively to them, solving doubts, questions, monitoring and showing how this whole process works. In addition, it will serve as a link between patient and family, welcoming and guiding not only patients, but also their families.

As a result, the patient feels welcomed, encouraged, gaining strength and reasons to continue the treatment, something that was not a reality before, given this lack of assistance. Thus, it is necessary to emphasize the importance of the Nurse Navigator in the lives of cancer patients, making them more recognized so that the professional can expand and be directed to work on the front line.

It is important to emphasize the need for further studies on the navigation performed by nurses, as well as its implementation, since it is an area of great value in which the patient will have self-centered care throughout the health-disease process, both in the Unified Health System (SUS) and in the complementary one.

REFERENCES

1. Siqueira, S. W. A., Fialho, I. R., Jaime, M., Pautasso, F. F., & Caregnato, R. C. A. (2022). Atuação do enfermeiro navegador em diferentes áreas da saúde: revisão integrativa. Brazilian Journal of Health Review, 5(5), 20755-20770. Available from: https://ojs.brazilianjournals.com.br/ojs/index.php/BJHR/article/view/53161

2. Pautasso, F. F., Zelmanowicz, A. M., Flores, C. D., & Caregnato, R. C. A. (2018). Atuação do Nurse Navigator: revisão integrativa. Revista Gaúcha de Enfermagem, 39(2017), 1-10. Available from: https://www.scielo.br/j/rgenf/a/cQ6Vhk5Qx6LxB88c95smxXs/

3. Borchartt, D. B., & Sangoi, K. C. M. (2022). A importância do enfermeiro navegador na assistência ao paciente oncológico: uma revisão integrativa da literatura. Research, Society and Development, 11(5), 1-8. Available from: https://rsdjournal.org/index.php/rsd/article/view/28024

4. Christensen, D., et al. (2017). Oncology Nurse Navigator Core Competencies. Oncology Nursing Society, 2-11. Available from: https://www.ons.org/sites/default/files/2017-05/2017_Oncology_Nurse_Navigator_Competencies.pdf

5. Corber, S., Padula, C., Grey, J., & Powell, M. (2011). Um Programa Breast Navigator: Barreiras, Melhoradores e Intervenções de Enfermagem. Fórum de Enfermagem Oncológica, 38, 44-50. Available from: https://sci-hub.se/10.1188/11.ONF.44-50

6. Rodrigues, R. L., Schneider, F., Kalinke, L. P., Kempfer, S. S., & Backes, V. M. S. (2021, April 16). Clinical outcomes of patient navigation performed by nurses in the oncology setting: an integrative review. Revista Brasileira De Enfermagem. Available from: https://pubmed.ncbi.nlm.nih.gov/33886831/

7. Pautasso, F. F., Lobo, T. C., Flores, C. D., & Caregnato, R. C. A. (2020). Nurse Navigator: desenvolvimento de um programa para o Brasil. Revista Latino-Americano Enfermagem, 28. Available from: https://www.scielo.br/j/rlae/a/ZMWdWh8DB6q76wsH8NvN7Xh/?format=pdf&lang=pt

8. Silva, L. C. A., Signor, A. C., Pilati, A. C. L., Dalfollo, B. R., & Oliveira, D. R. (2019). Abordagem Educativa ao Paciente Oncológico: Estratégias para Orientação acerca do Tratamento Quimioterápico. Revista Brasileira De Cancerologia, 65(1). Available from: https://docs.bvsalud.org/biblioref/2019/11/1026456/abordagem-educativa-ao-paciente-oncologico-estrategias-para-or_toZuBV6.pdf

9. Trajano, R. C., Alves, L. L., Decaino, L. L. C. S., Whitaker, M. C. O., & Amaral, J. B. (2022). Atuação de enfermeiras navegadoras oncológicas na pandemia covid-19: desafios e inovações. Enfermagem em Foco, 13. Available from: https://enfermfoco.org/wp-content/uploads/articles_xml/2357-707X-enfoco-13-spe1-e-202227spe1/2357-707X-enfoco-13-spe1-e-202227spe1.pdf

10. Silva, T. C. M. S., Castro, M. C. N., & Popim, R. C. (2018). Adaptação do Nursing Activities Score para assistência oncológica. Revista Brasileira de Enfermagem, 71(5). Available from: https://www.scielo.br/j/reben/a/Pm4ZgVvJxGB6MPgVhGBBrYq/?format=pdf&lang=pt

11. Yackzan, S., et al. (2019). Patient satisfaction scores and contact with oncology nurse navigators. Clinical Journal of Oncology Nursing, 23(1), 76-81. Available from: https://sci-hub.se/10.1188/19.CJON.76-81

12. COFEN. Conselho Federal de Enfermagem. (1998). Resolução COFEN nº 210/1998. Available from: http://www.cofen.gov.br/resoluo-cofen-2101998_4257.html

Contemporaneity and the racing thinking syndrome: Risk factors, symptoms, diagnoses and forms of treatment

https://doi.org/10.56238/sevened2024.005-008

Francisco Roldineli Varela Marques[1], Astor Castro Barbosa Neto[2], Claudia Regina de Freitas[3], Teddy Talbot[4], Isabela Malerba Pinheiro[5], Fernanda Moraes de Abreu[6], Magno Fernando Almeida Nazaré[7], Natanael Cazuza Sales da Silva[8], Fernanda Pereira dos Santos[9], Marcos André de Souza[10] and Umberto Pereira Souza Júnior[11]

[1] Highest academic background in the undergraduate area: Master's Degree in Business Administration - UFRN
Current institution: Federal Rural University of the Semi-Arid
E-mail: roldineli.varela@gmail.com
[2] Higher academic background with undergraduate area: Specialization in Neuropsychology
University: Specialization(IPOG) Graduation (Unime)
E-mail: astor_30@hotmail.com
ORCID: https://orcid.org/0009-0003-5022-5689
[3] Dr. in Public Health
Serra Dourada College of Lorraine
Guaratinguetá/SP
E-mail: psicocrfreitas@gmail.com
[4] Dr. in Neurosciences
University of São Paulo - USP
Campus Ribeirão Preto - SP.
E-mail: teddytalbot17@gmail.com
ORCID: https://orcid.org/0000-0002-7505-9440
[5] Highest academic background with undergraduate area Undergraduate student of Medicine
University: Pontifical Catholic University of Minas Gerais
E-mail: malerbapinheiro@gmail.com
Orchid:Hattapus://Orkid.org/0009-0005-6044-4265
[6] Highest academic background in undergraduate area: Postgraduate in Dermatology and Medical Expertise.
University: UDABOL - Revalidation UFMT (Cuiabá Campus. Av. Fernando Corrêa da Costa, nº 2367. Bairro Boa Esperança - Cuiabá - MT CEP: 78060-900)
E-mail: drafernandaabreu@hotmail.com
ORCID: 0009-0004-1197-7068
[7] Master's student in Professional and Technological Education
Federal Institute of Education, Science and Technology of Maranhão IFMA.
Email: magnoff.almeida@hotmail.com
ORCID: https://orcid.org0000-0002-0871-1814
[8] Education: Nursing-Bachelor's Degree
Current institution: Faculdade Pitágoras Bacabal (MA)
E-mail: Cazuza437@gmail.com
ORCID: https://orcid.org/0000-0001-5021-577X
[9] Medical Student
University: Centro Universitário Fametro- Manaus
E-mail: nanda.anjo1000@gmail.com
ORCID: 3696296974116607
[10] Master's student in Human Rights (UNIT-SE)
University: Tiradentes University - Aracaju/Sergipe
E-mail marcos.andre.se2@gmail.com
[11] Dr. n Development and Technological Innovation in Medicines.
University: Federal Rural University of Pernambuco - UFRPE.
E-mail: umbertociencias@gmail.com

ABSTRACT
This research aimed to analyze the risk factors, symptoms, diagnoses, and treatments associated with Accelerated Thinking Syndrome. To this end, a literature search was applied and, as a result, it was found that Accelerated Thinking Syndrome is a contemporary phenomenon that affects people's mental health and quality of life, characterized by acceleration of mental processes, cognitive overload, and constant feeling of haste. Factors such as fast-paced lifestyle, exposure to digital stimuli, and personality traits can all contribute to their development. Proper diagnosis requires careful evaluation of symptoms and medical history. Treatment involves a multidisciplinary approach, including psychotherapy, relaxation techniques, self-care, and lifestyle modifications. Understanding the syndrome and seeking balance between daily demands and personal well-being are essential to promote mental health and improve quality of life.

Keywords: Racing Thinking Syndrome, Anxiety, Psychic.

INTRODUCTION

Racing Thinking Syndrome is a contemporary phenomenon that has aroused interest and concern in the field of mental health. Characterized by an intense acceleration of mental processes, cognitive overload, and a constant feeling of haste, this syndrome has significant impacts on individuals' lives. Understanding the effects of this syndrome on quality of life is essential for the development of intervention strategies and well-being promotion (CURY, 2013).

In the current context, marked by an accelerated pace of life, technological advances and an overload of information, Accelerated Thinking Syndrome has manifested itself in an increasingly frequent and evident way. The individual affected by this syndrome feels an incessant mental agitation, with a mind that does not stop producing thoughts, questions and worries, resulting in a difficulty in slowing down and relaxing (GARCIA, 2017).

The impacts of Racing Thinking Syndrome are vast and encompass different areas of the individual's life. In the emotional sphere, there is a greater propensity to stress, anxiety and even the emergence of mental disorders such as depression. Constant mental agitation can generate a feeling of inability to cope with the demands of daily life, in addition to impairing sleep and the ability to concentrate (RIOS, 2004).

In addition to the emotional aspects, the syndrome also affects the individual's social and interpersonal life. Excessive thinking and worrying can make it difficult to interact with others, resulting in feelings of isolation and difficulty establishing healthy relationships. Academic and professional performance can also be impaired, since mental hyperactivity hinders focus, organization, and productivity (CURY, 2017).

In view of these challenges, this research aimed to analyze the risk factors, symptoms, diagnoses and treatments associated with Accelerated Thinking Syndrome. To achieve this general objective, the following specific objectives were established: to identify the main risk factors that contribute to the development of Accelerated Thinking Syndrome; analyze the characteristic symptoms of this syndrome and its manifestation in the emotional, social, academic and professional spheres; investigate the diagnostic methods and criteria used to identify Racing Thinking Syndrome.

To this end, a bibliographic research was applied through the survey of articles, theses, books and reliable sources of research that address the emotional, social, academic and professional aspects related to this syndrome. The bibliographic surveys took place on platforms such as: Scielo, Google Scholar and PubMed.

Through the analysis and synthesis of scientific studies and relevant publications, it was possible to identify the main aspects related to this syndrome and its effects on the various domains of life. This review proved to be essential to support strategies for intervention and promotion of mental health, with the aim of improving the quality of life and well-being of affected individuals.

From the analysis of the results found, it is expected to contribute to the understanding of this phenomenon and subsidize actions aimed at promoting mental health and better coping with the challenges imposed by Accelerated Thinking Syndrome. By understanding the extent of the impacts of this syndrome on quality of life, it will be possible to develop more effective intervention and prevention strategies, aimed at both mental health professionals and individuals experiencing Accelerated Thinking Syndrome. The search for solutions that minimize the negative effects and promote a more balanced and satisfying life for these people becomes, therefore, a relevant challenge of great importance in contemporary times.

DEVELOPMENT

ACCELERATED THINKING SYNDROME: HISTORICAL CONTEXTUALIZATION AND CONCEPTS

Racing Thinking Syndrome is, according to Cury (2017), a contemporary phenomenon that has gained prominence in the area of mental health. Characterized by an acceleration of mental processes, an incessant flow of thoughts, and a constant feeling of haste, this syndrome has had significant impacts on people's lives. To understand this condition more deeply, it is necessary to contextualize it historically and understand its fundamental concepts.

The Accelerated Thinking Syndrome emerges in a social and cultural context marked by technological advancement, increased speed of information, and rapid and constant changes. This acceleration affects not only the rhythm of everyday life but also the human mind, leading to the emergence of this syndrome characterized by mental hyperactivity (CURY, 2017).

As Garcia (2017) points out, the term "Accelerated Thinking Syndrome" was introduced by Brazilian psychiatrist Augusto Cury in his book "Anxiety: How to Face the Evil of the Century". Cury described the syndrome as a condition in which the mind is constantly occupied with an uninterrupted stream of thoughts, questions, and worries, resulting in a difficulty slowing down and relaxing.

This syndrome is closely linked to the acceleration of the contemporary world, in which people are increasingly burdened with multiple demands, tight deadlines, and information in constant flux. The pressure for productivity, success, and personal achievements also contributes to mental acceleration. Constant access to electronic devices and the need to always be connected also influence the mental hyperactivity characteristic of this syndrome (CURY, 2017).

For Olaf (2015), one of the fundamental concepts related to Accelerated Thinking Syndrome is "cognitive overload". This term refers to the excess of stimuli and information that the brain needs to process on a daily basis, leading to an excessive load of cognitive work. Cognitive overload can

lead to mental fatigue, difficulty concentrating, reduced ability to make decisions, and increased stress.

Another important concept is that of "mental rumination." People with Racing Thinking Syndrome tend to constantly ruminate on thoughts and worries, reliving past events or incessantly anticipating future events. This intense and continuous mental rumination hinders the ability to relax and enjoy the present moment (OLAF, 2015).

Importantly, Racing Thinking Syndrome should not be confused with Generalized Anxiety Disorder (GAD) or other mental disorders. Although there may be overlapping symptoms, the syndrome is mainly characterized by an acceleration of mental processes and cognitive overload, while anxiety disorders involve an intense and persistent emotional response (FERRAZ-FILHO; BRANDÃO, 2015).

In short, Racing Thinking Syndrome is a contemporary phenomenon that manifests itself as an acceleration of mental processes, cognitive overload, and a constant feeling of haste. Contextualized in a fast-paced world full of information, this syndrome affects people's daily lives, negatively influencing mental health and quality of life. Understanding its concepts and characteristics is essential to develop intervention strategies and promotion of well-being.

RISK FACTORS ASSOCIATED WITH RACING THINKING

Racing Thinking Syndrome is a complex phenomenon that can be influenced by a variety of factors. These risk factors can contribute to the development and worsening of this condition, making it important to identify and understand them in detail.

According to Cury (2015), one of the main risk factors associated with Accelerated Thinking is a fast-paced and stressful lifestyle. The contemporary world, with its constant demands, tight deadlines, and a culture that values productivity and success, can lead people to a frenetic pace of life. Excessive activity, overload of responsibilities and pressure for results can overwhelm the individual, contributing to mental acceleration.

Another relevant risk factor is constant exposure to digital stimuli. Technology plays a significant role in accelerating thinking, as electronic devices such as smartphones and computers provide immediate access to information, social networks, messages, and notifications. The constant connection and the need to always be up to date can generate a feeling of haste and contribute to mental acceleration (CURY, 2015).

Authors such as Tisser (2017) add that cognitive overload is a central risk factor associated with Accelerated Thinking. The excessive amount of information, tasks, and stimuli that people are exposed to on a daily basis can lead to a heightened cognitive workload. The need to process and

assimilate a large amount of data can lead to a constantly busy mind, making it difficult to slow down and calm down mentally.

Personality traits can also influence the development of Accelerated Thinking. Individuals with a tendency toward perfectionism, high self-demand, and a strong desire for control are more likely to experience an acceleration of mental processes. The relentless pursuit of excellence and the fear of making mistakes can lead to a constant stream of thoughts and worries (TISSER, 2017).

In addition, Wilson (2011) emphasizes that past experiences of stress, trauma, or challenging situations can increase vulnerability to Accelerated Thinking. Traumatic events, such as significant losses, health problems, or personal difficulties, can lead to a state of mental hyperactivity as a way of trying to cope with these situations.

SYMPTOMS OF RACING THINKING

According to Cury (2015), one of the most common symptoms is the presence of an incessant flow of thoughts. People who suffer from this syndrome have difficulty slowing down their mind, experiencing a continuous flurry of rapidly succeeding thoughts, making it difficult to focus on a single task or appreciate the present moment. These thoughts can be varied in nature, including worries, questions, future plans, or constant reflections on past events.

Also according to the author, another frequent symptom is the feeling of constant haste. Individuals with Accelerated Thinking have the perception that time is passing too fast and that they need to hurry to keep up with the fast pace of everyday life. This feeling of haste can lead to constant restlessness and impatience, making it difficult to relax and calm mind.

Difficulty relaxing and slowing down is a hallmark symptom of the syndrome. Even when they are in moments of rest or leisure, the person with Racing Thinking continues to have a restless mind, unable to disconnect from thoughts and worries. This can lead to difficulties sleeping, as the mind remains active even during the night, interfering with restful sleep (CURY, 2015).

For Tisser (2017), cognitive overload is another relevant symptom. The individual with Accelerated Thinking feels constantly overwhelmed by the amount of information they need to process and assimilate. This overwhelm can result in difficulty concentrating, a lack of mental clarity, and a feeling of being mentally drained.

In addition, anxiety is also commonly associated with Racing Thinking. The acceleration of mental processes and cognitive overload can generate an anxious response, since the mind is constantly occupied with worries and anticipations. Anxiety can manifest itself through physical symptoms such as tachycardia, sweating, muscle tension, and rapid breathing (TISSER, 2017).

In addition, Racing Thinking Syndrome can affect the ability to make decisions. With the mind constantly occupied with a multiplicity of thoughts, the individual may have difficulty focusing

on a single task or analyzing all options appropriately, resulting in hasty decisions or a lack of clarity in choices. It is important to note that the presence of these symptoms does not necessarily mean that the person has the syndrome clinically. However, when these symptoms are persistent, cause significant distress, and interfere with daily activities and quality of life, it is recommended to seek professional support for an appropriate diagnosis and therapeutic guidance (CURY, 2015).

DIAGNOSIS OF RACING THINKING

Diagnosing Racing Thinking Syndrome involves careful evaluation of symptoms, medical history, and a comprehensive analysis of the individual's cognitive and emotional functioning. Although there are no specific diagnostic criteria for this syndrome, mental health professionals can utilize a comprehensive approach to assess and identify the presence and severity of symptoms (CURY, 2015).

Initially, according to Fu-I et al. (2012), the health professional should conduct a detailed clinical interview with the individual, seeking to understand the nature of racing thoughts, the frequency and intensity of symptoms, as well as the impact on quality of life and daily activities. It is important to obtain information about the duration of symptoms, their progression over time, and any triggering or aggravating factors.

In addition to the clinical interview, validated questionnaires and rating scales can be used, which help in the identification and quantification of symptoms associated with Accelerated Thinking. These tools can help document symptoms more objectively and provide a comparative basis for tracking evolution over time (FU-I et al., 2012).

According to Abreu et al. (2006), the individual's medical and psychiatric history is also fundamental for the diagnostic process. It is important to rule out the presence of medical or psychiatric conditions that may be contributing to the symptoms of racing thinking. Anxiety disorders, obsessive-compulsive disorder, mood disorders, and attention deficit hyperactivity disorders are some of the conditions that can present with symptoms similar to Racing Thinking.

In addition, cognitive assessment may be performed to identify possible difficulties with attention, concentration, memory, or executive functioning associated with the syndrome. Neuropsychological testing and other specific assessments can be used to identify cognitive deficits or atypical patterns of brain functioning. It is worth mentioning that the diagnosis of Racing Thinking Syndrome should be made by qualified mental health professionals, such as psychologists or psychiatrists. They have the expertise to assess symptoms, rule out other similar conditions, and establish an accurate diagnosis (ABREU et al., 2006).

It is important to highlight that the diagnosis of Accelerated Thinking is a tool to understand and categorize the symptoms, helping to direct appropriate treatments and intervention strategies.

Each individual is unique, and treatment should be personalized, taking into account the specific needs and severity of the symptoms presented (TISSER, 2017).

TREATMENT OF RACING THINKING

The treatment of Racing Thinking Syndrome aims to relieve symptoms, promote mental balance, and improve the individual's quality of life. Treatment usually involves a multidisciplinary approach, combining psychotherapeutic interventions, relaxation and self-care techniques, lifestyle modifications, and, in some cases, the use of medications (WILSON, 2011).

From Frankl's (2018) perspective, psychotherapy plays a key role in the treatment of Accelerated Thinking. Cognitive-behavioral therapies (CBT), acceptance and commitment therapy (ACT), and mind-focused therapy can be utilized to help the individual develop self-awareness skills, identify and challenge dysfunctional thought patterns, manage anxiety, and promote a shift in perspective regarding the time and demands of everyday life. Therapy can also address issues related to self-demand, perfectionism, and developing effective coping strategies.

In addition to therapy, relaxation and self-care techniques are important to reduce mental acceleration. Regular physical exercise, such as walking, yoga, or meditation, can help calm the mind, reduce anxiety, and promote a state of relaxation. Deep breathing, mindfulness, and engaging in pleasurable activities can also be incorporated as part of treatment (FRANKL, 2018).

Lifestyle modification also plays a significant role in treating Accelerated Thinking. This includes setting healthy boundaries, prioritizing activities that promote relaxation and well-being, establishing a proper sleep routine, and making time for rest and leisure. Reducing the time of exposure to digital stimuli, establishing regular breaks during the day, and practicing organization and time management techniques can also help slow down the mind (TISSER, 2017).

In some cases, medications may be prescribed to aid in the treatment of Racing Thinking. Medications may include anxiolytics, mood stabilizers, or antidepressants, depending on the patient's individual symptoms and needs. It is important to discuss the benefits, risks, and side effects of medications with a medical specialist, such as a psychiatrist, before starting any pharmacological treatment (CURY, 2015).

FINAL THOUGHTS

Based on this bibliographic research, it is found that Accelerated Thinking Syndrome is a contemporary phenomenon that has stood out in the area of mental health, affecting people's daily lives and interfering with quality of life. This syndrome is characterized by an acceleration of mental processes, cognitive overload, and a constant feeling of haste.

Thus, understanding the concepts, risk factors, symptoms, and diagnosis associated with Accelerated Thinking is essential for the development of intervention strategies and promotion of well-being. Factors such as fast-paced lifestyle, constant exposure to digital stimuli, cognitive overload, personality traits, and past experiences of stress can all contribute to the development and worsening of this condition.

Proper diagnosis of the syndrome requires careful evaluation of symptoms, medical history, and a comprehensive analysis of the individual's cognitive and emotional functioning. Qualified mental health professionals play a key role in this process, using clinical interviews, questionnaires, and specific assessments to accurately identify and categorize symptoms.

The treatment of Accelerated Thinking, on the other hand, involves a multidisciplinary approach, combining psychotherapy, relaxation and self-care techniques, lifestyle modifications and, in some cases, the use of medications. Psychotherapy plays a key role in promoting self-knowledge, developing strategies to deal with racing thoughts, and seeking mental balance. Relaxation techniques, such as meditation and mindfulness, can help calm the mind and reduce anxiety.

Additionally, it is essential for people to adopt self-care practices, such as setting healthy boundaries, prioritizing rest and leisure, pursuing pleasurable activities, and learning to slow down. Lifestyle modifications, such as reducing exposure to digital stimuli, establishing balanced routines, and seeking a balance between daily demands, are also important for dealing with Accelerated Thinking.

REFERENCES

1. Abreu, C. N. et al. (2006). Síndromes psiquiátricas: diagnóstico e entrevista para profissionais de saúde mental. Editora Artmed.

2. Cury, A. (2013). Ansiedade: como enfrentar o mal do século. Editora Benvirá.

3. Ferraz-Filho, J. C., & Brandão, D. G. (2016). A Cultura Brasileira como Nexo Causal de Acidente de Trabalho. *E&S - Engineering and Science, 2*(5).

4. Frankl, V. E. (2018). Psicoterapia para todos. Petrópolis: Editora Vozes.

5. Fu-I, L. et al. (2012). Transtornos afetivos na infância e adolescência – Diagnóstico e tratamento. *J Bras Psiquiatr, 61*(2), 114-115.

6. Garcia, A. F. (2017). Educação em saúde em ambientes escolares: a síndrome do pensamento acelerado (Dissertação de mestrado). Universidade do Vale do Rio dos Sinos.

7. Rios, R. O. B. (2004). Alunos e língua estrangeira: a síndrome do pensamento acelerado em turmas de educação popular. *Revista de Educação Popular, *(3).

8. Tisser, L. (2017). Baralho da ansiedade. Novo Hamburgo: Sinopsys.

9. Ulaf, M. (2015). Compreensão e reciclagem das ruminações mentais. *Conscientia, 19*(4), 435-443.

10. Wilson, R. (2011). Terapia cognitivo-comportamental para leigos. Rio de Janeiro: Alta Books.

Segmental osteotomy with interpositional xenogenous graft in posterior mandible

https://doi.org/10.56238/sevened2024.005-009

Vilton Zimmermann de Souza[1], Gislaine F. F. Garcia[2], Rafael Manfro[3] and Vinícius Fabris[4]

ABSTRACT

With the loss of dental elements, natural bone dimensional changes occur, which often make it impossible to install dental implants without the need for grafting procedures prior to implant surgery for the esthetic-functional rehabilitation of our patients. Correcting vertical bone defects to re-establish the correct relationship of the alveolar crest in the posterior mandible is a major challenge for implant dentists.

In the literature, segmental osteotomy associated with interpositional bone grafting has been shown to be a viable alternative for bone rehabilitation in vertical bone defects in the posterior mandible, provided that the correct indications are followed, with the appropriate surgical techniques.

In this specific case, the interpositional grafting technique represented a safe and predictable procedure for vertical bone augmentation with segmental osteotomy associated with interpositional grafting. Segmental osteotomies associated with interpositional grafts are considered a predictable technique, provided they are well indicated and respect biological and technical limits for the rehabilitation of atrophic mandibular posterior regions. Success rates in the literature are very high, as is the survival of dental implants placed in the augmented areas.

Keywords: Atrophic mandible, Bone graft, Bone augmentation, Vertical ridge augmentation, Interpositional graft.

[1] Highest academic background: Master in implantology
Institution: São Leopoldo Mandic
E-mail: viltonsouza@yahoo.com.br
[2] Highest academic background: Master's degree in implantology
Institution: São Leopoldo Mandic
E-mail: gislainefelipe@hotmail.com
[3] Highest academic background: PhD in implantology
Institution: São Leopoldo Mandic
E-mail: manfroimplante2@hotmail.com
[4] Highest academic background: Specialist in Oral and Maxillofacial Surgery and Traumatology
Institution: Faculdade Meridional IMED Passo Fundo
E-mail: viltonsouza@yahoo.com.br

INTRODUCTION

With the loss of dental elements, there are always natural bone dimensional changes, which often end up making it impossible to install dental implants without the need for grafting procedures prior to implant surgeries for the aesthetic-functional rehabilitation of our patients. The correction of vertical bone defects to reestablish the correct relationship of the alveolar crest in posterior regions of the mandible is considered a great challenge for implantologists (TANAKA, K et al, 2017; De Souza et al,2021; De Souza et al, 2023).

In the literature, segmental osteotomy associated with interpositional bone grafting has been shown to be a viable alternative for bone rehabilitation in vertical bone defects in the posterior region of the mandible, provided that the correct indications are followed, with the appropriate surgicaltechniques. It is reported to be a predictable and viable technique with low complication rates. The correction of moderate vertical bone defects (4-8 mm) andin the posterior mandibular and anterior regions of the maxillae are also indicated to reposition poorly positioned implants and have high success rates (NOIA, C.F et al, 2012; De Souza et al,2022).

In a prospective, controlled, split-mouth study of 11 partially edentulous patients that evaluated the stability of dental implants placed in mandibular areas with angiotomies with interpositional grafts using non-ceramic hydroxyapatite or autogenous grafts tag. After a 1-year loading period, the implant survival rate was 95.45%, with two implant losses (one from each group). Among the surviving implants (42 out of 44), two did not meet the success criteria; Therefore, the success rate of the implantwas 90.90%. Stability measures were similar between groups during the 12-month follow-up ($p > 0.05$). The interpositional graft technique seems to represent a safe and successful procedure, at least after a 12-month follow-up (DOTTORE A.M, 2012). In a systematic review of the literature on the success of Segmental Sandwich Osteotomy of the posterior mandible in pre-implantation surgery, only 17 articles met the predetermined inclusion and exclusion criteria. They consisted of 9 retrospective or serial case reports and 8 prospective randomized controlled trials. Overall, thestudiesincluded 174 patients. In these patients, 214 bone augmentation procedures with segmental osteotomies associated with interpositional implants were performed in the posterior mandibula and 444 implants were installed . The follow-up period after implant loading ranged from 8 months to 5.5 years. The success rate ranged between 90% and 100%. Segmental osteotomies associated with interpositional grafts should be considered as a well-documented technique for the rehabilitation of atrophic posterior regions ofthe mandible with long-term postoperative follow-up. Success rates are very high, as well as the survival of dental implants placed inthe increased area (KAMPEROS, G et al, 2016).

DESCRIPTION OF THE CLINICAL CASE

A 37-year-old female patient came to the private clinic reporting functional discomfort in the posterior region of the mandible, in addition to great aesthetic dissatisfaction. After a detailed anamnesis, it was found that the patient did not have any systemic involvement. Clinical examination revealed a severe vertical bone discrepancy in the left mandibular posterior region (Figure 1). On CT scanning, elements 35, 36 and 37 were absent, as well as an increase in the interocclusal space and insufficient bone height for the installation of conventional dental implants between the alveolar crest and the inferior alveolar nerve (Figures 2a and 2b).

Figure 1. Initial appearance showing vertical bone defect in the posterior of the left mandible .

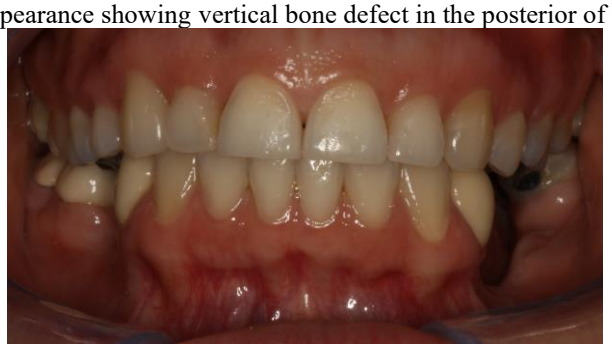
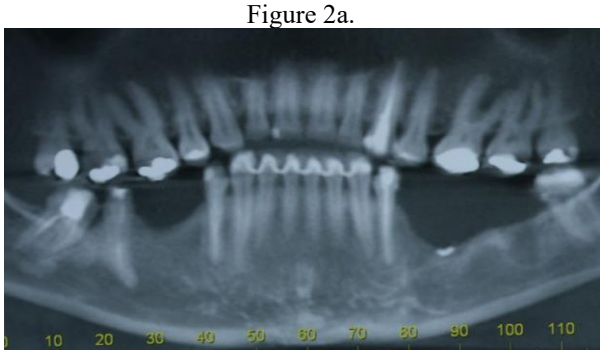
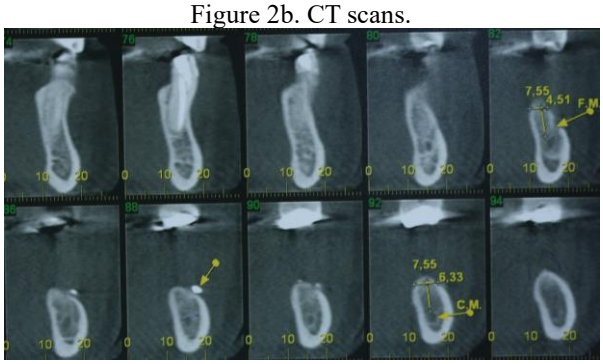


Figure 2a.



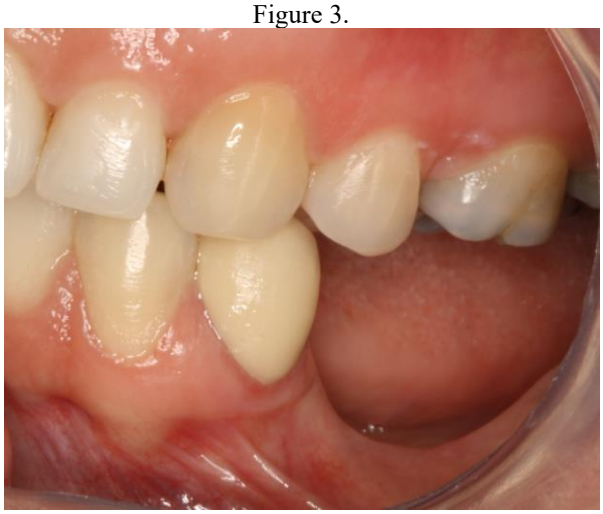
Note the presence of vertical deficiency in the posterior region of the left jaw.

Figure 2b. CT scans.



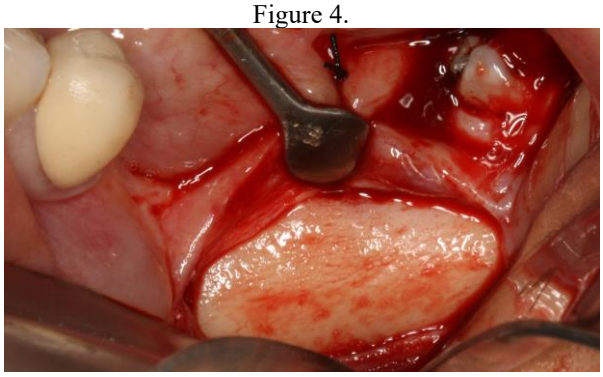
The case wascarefully planned and the technique chosen was segmental osteotomy with interpositional graft with biomaterial (Geistlich Bio-Oss®), aiming at the adequate rehabilitation of the alveolar ridge, prior to the installation of dental implants, followed by prosthetic rehabilitation.

Figure 3.



Lateral view of the bone defect. Notice bone discrepancy present.

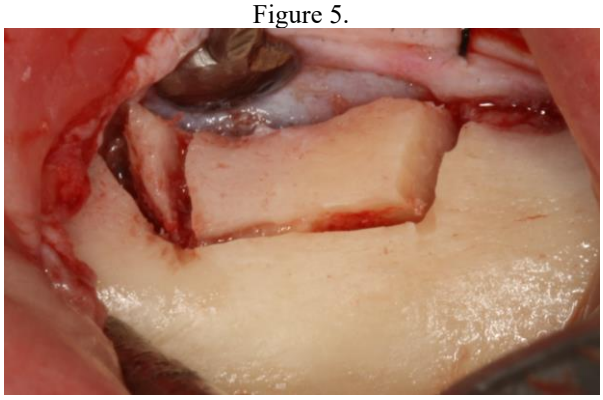
Figure 4.



Incision at the bottom of the groove and detachment.

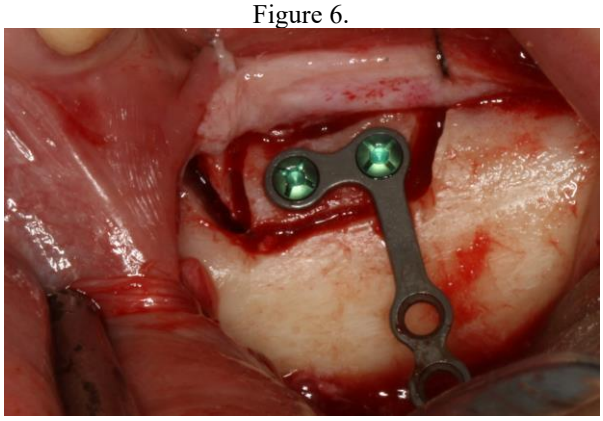
The anesthetic procedure of inferior alveolar nerve block, lingual and buccal block, was performed with a 2% lidocaine solution with a vasoconstrictor of 1:100,000 (DFL, Rio de Janeiro/RJ, Brazil). Soon after, a linear incision was made with an approximate location of 3 mm below the mucogingival line, giving access to the decodingof the mucoperiosteal flap (Figure 4) and the creation of two divergent vertical osteotomies and one horizontal osteotomies , using a 701 drill in high rotation (Figure 5).

Figure 5.



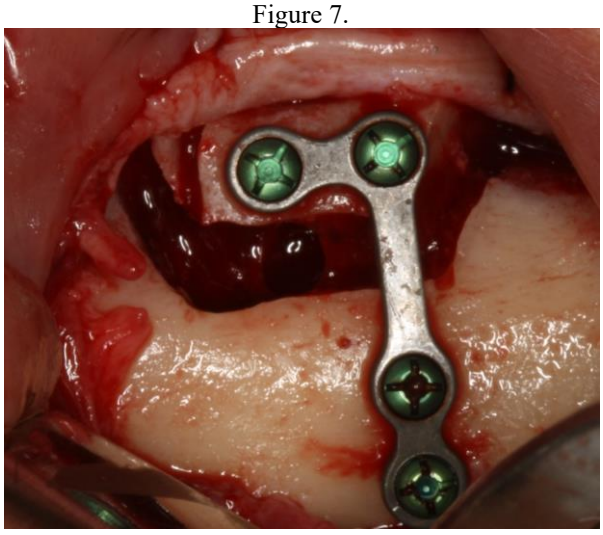
Osteotomy. Note the divergent vertical osteotomies.

Figure 6.



Attaching the plate to the block. The bone block remains attached to the lingual periosteum to ensuremaintenance of irrigation.

Figure 7.

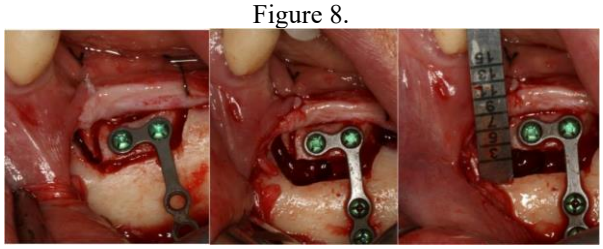


Fixation.

Catheters were used to complete the osteotomy in order to avoid laceration of the lingual mucosa, which is of fundamental importance for the maintenance of bone block irrigation. The mobilized bone segment was fixed with plates and screws (Figs 6 and 7) at the determined height (Figure 8). Then, the gap was filled with Bio-Oss® (Geistlich) grafting biomaterial (Figure 9) and stabilized with Bio-G-ide® membrane (Figure 9b). To complete the procedure, a final suture was performed (Figure 10). After 6 months, agraphic examination was requested (Figures 10b and 10c)

and reopening (Figure 10d) was performed to remove the plaque and install the dental implants (Figure 11).

Figure 8.



Remaining Space Fill (GAP).

Figure 9.Filling the gap with Bio-O ss®.

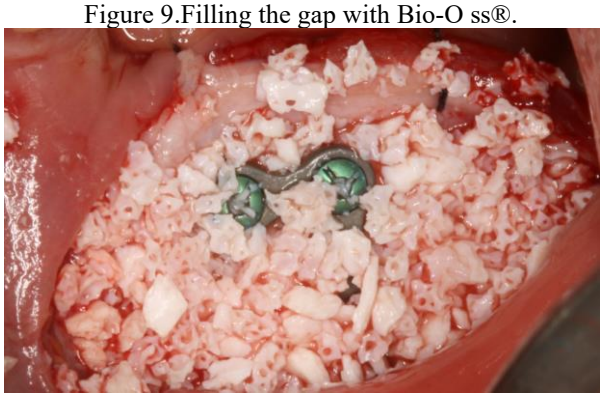
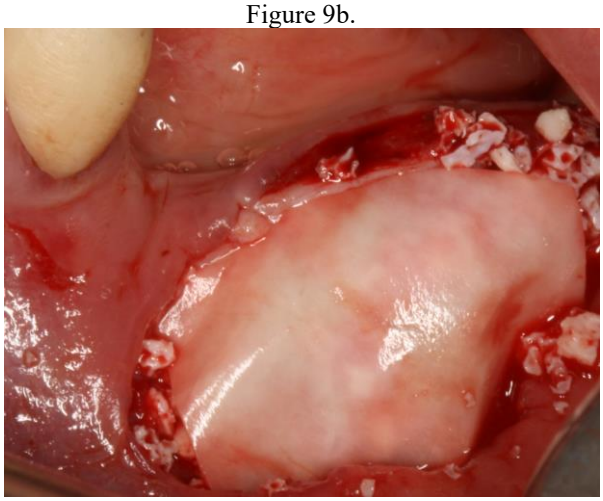
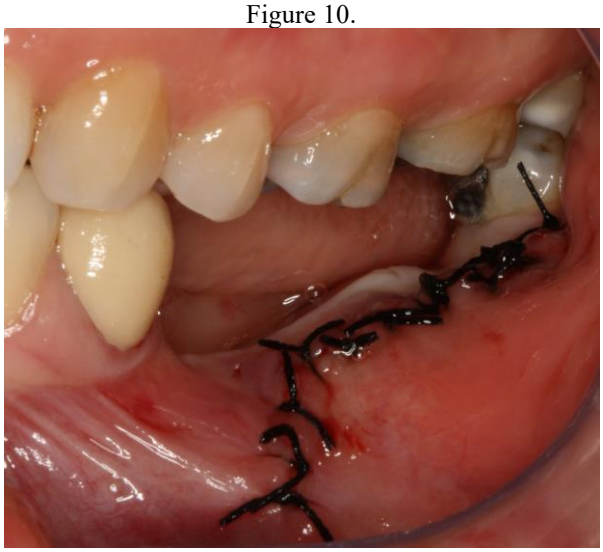


Figure 9b.



Bio-G ide® membrane placement.

Figure 10.



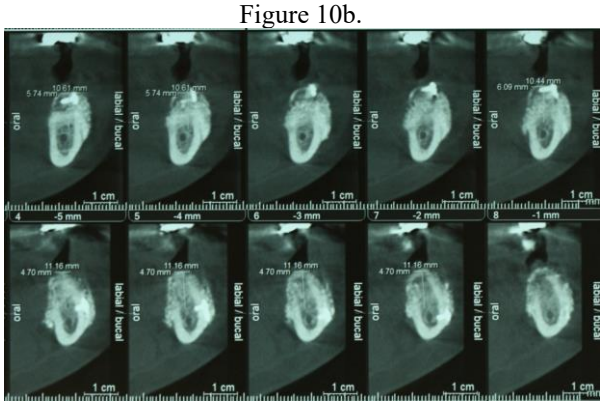
Final suture.

Figure 10d. Time of reopening: 6 months after grafting for plaque removal.

Figure 10a.

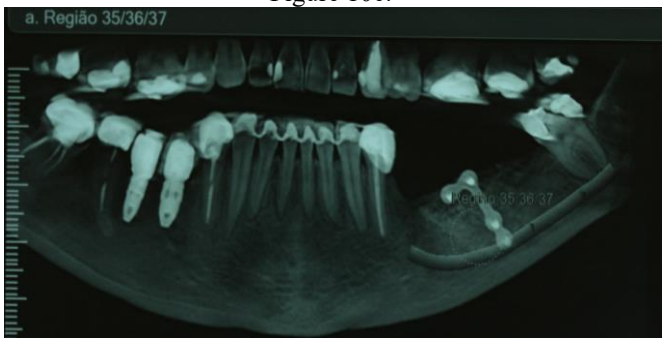
Final side view.

Figure 10b.



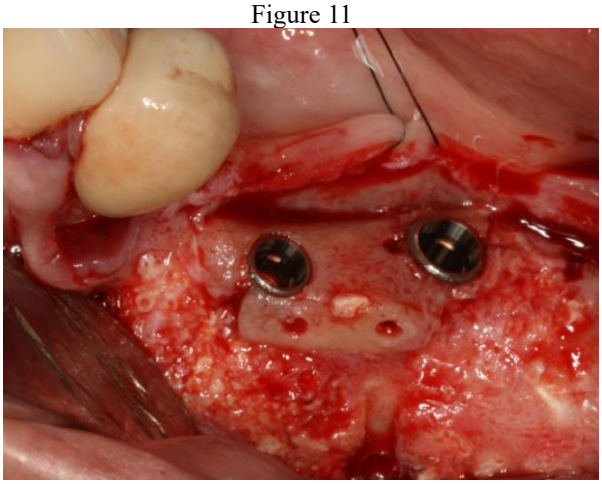
CT scan 6 months after grafting.

Figure 10c.



CT scan 6 months after grafting. Note the relevant vertical gain obtained.

Figure 11



FINAL THOUGHTS

Vertical bone loss in the posterior jaw , due to the low bone height and the presence of the mandibular canal, ends up limiting the installation of dental implants in thisregion.

There is also an aesthetic limitation and also from the biomechanical point of view, due to the increase in the interocclusal space, making thecrown/implant ratio disproportionate due to the increase in the size of the teeth.

In this clinical case, after evaluating the region to be operated, it was planned to segmental osteotomy with interpositional xenogenous bone graft (Geistlich Bio-Oss®) andGeistlich Bio-

Gade® collagen membrane). The technique described, when well indicated, is predictable and presents another great option for performing vertical bone augmentation surgeries in the posterior region of the mandible.

It is another safe tool within our range of tools to treat vertical atrophies, with less surgical morbidity compared to other autogenous grafting and osteogenic dysfunction techniques.

REFERENCES

1. NOIA, C. F., ORTEGA, R. L., MAZZONETTO, H. D. M., & CHAVES, N. Segmental osteotomy with interpositional bone grafting in the posterior maxillary region. Int. J. Oral Maxillofac. Surg., 41, 1563–1565. (2012).

2. Tanaka, K., Sailer, I., Kataoka, Y., Nogami, S., & Takahashi, T. Sandwich bone graft for vertical augmentation of the posterior maxillary region: a case report with 9-year follow-up. International Journal of Implant Dentistry, 3, 20. doi:10.1186/s40729-017-0063-9. (2017).

3. de Souza, V. Z., de Souza Anesi, R., Schoenberger, E., Manfro, R., Garcia, G. F., & Sartori, R. Implante curto unitário em região posterior de mandíbula: relato de caso clínico. Brazilian Journal of Health Review, 4(1), 2531-2541. (2021).

4. DE SOUZA, V., Schoenberger, E., Francisco Wesoloski, R., Garcia, G., Rosalen da Silva, R., & Manfro, R. Horizontal Bone Augmentation in the Mandible by Subperiosteal Tunneling Technique: Case Report. International Journal of Innovative Research in Medical Science, 8(02), 77–81. (2023).

5. de Souza, V. Z., Garcia, G. F., da Silva, L. R., Schoenberger, E., de Souza Anesi, R., & Manfro, R. Reconstrução de maxila atrófica com osso homógeno fresco congelado–14 anos de follow-up: Recontruction of atrophic maxilla with fresh frozen homogenous bone–14 years of follow-up. Brazilian Journal of Health Review, 5(4), 14473-14482. (2022).

6. Dottore, A. M., Kawakami, P. Y., Bechara, K., Rodrigues, J. A., Cassoni, A., Figueiredo, L. C., Piattelli, A., & Shibli, J. A. Stability of Implants Placed in Augmented Posterior Mandible after Alveolar Osteotomy Using Resorbable Nonceramic Hydroxyapatite or Intraoral Autogenous Bone: 12-Month Follow-Up. Clinical Implant Dentistry and Related Research, 16, 330–336. doi:10.1111/cid.12010. (2014).

7. Kamperos, G., Zografos, I., Tzermpos, F., & Iatrou, I. Segmental sandwich osteotomy of the posterior mandible in pre-implant surgery - A systematic review. Medicina Oral, Patología Oral y Cirugía Bucal, 22(1), e132e141. doi:10.4317/medoral.21633. (2017).

Evaluation of new minimally invasive approaches in surgeries

https://doi.org/10.56238/sevened2024.005-010

Renata Ferreira Sousa[1], Lucas Pereira Figueiredo[2], Mauricio Simon Paiva[3] and Matheus Brandão Guimarães Santos[4]

ABSTRACT

Minimally invasive surgery is a technique that aims to reduce pain and recovery time for patients, as well as minimize complications related to the surgical procedure. Since its origin, with laparoscopy, in 1910, minimally invasive techniques have been widely used in different areas of medicine, including cardiac, gynecological, orthopedic surgery, among others.

Keywords: Surgical techniques, Minimally invasive approach, Medicine.

[1] Faculty of origin: graduated from the University of Uberaba (UNIUBE)
Doctor
E-mail: renataferreirasousa@hotmail.com
[2] Resident in General Surgery HC UFTM
E-mail:lucas.p.figueiredo@hotmail.com
[3] academic medicine UNIFENAS
E-mail: mauriciosp@hotmail.com
[4] Athens College - Paracatu MG
E-mail :mbrandaogsantos@gmail.com

INTRODUCTION

Minimally invasive surgery is a technique that aims to reduce pain and recovery time for patients, as well as minimize complications related to the surgical procedure. Since its origin, with laparoscopy, in 1910, minimally invasive techniques have been widely used in different areas of medicine, including cardiac, gynecological, orthopedic surgery, among others.

Laparoscopy was the first minimally invasive technique used in surgery, allowing surgical interventions to be performed with the aid of an endoscope. This technique has been shown to be effective in performing abdominal surgeries, such as gallbladder removal, hernias, and appendicitis (SEMM, 1983).

With the advancement of technology and the miniaturization of surgical instruments, other minimally invasive techniques have been developed, such as minimally invasive thoracic surgery, which allows lung and mediastinal surgeries to be performed with less trauma to the patient, and minimally invasive cardiac surgery, which allows cardiac surgeries to be performed with a smaller incision (SWANSON *et al.*, 2012).

In addition, the development of new technologies, such as robotics, has allowed surgeons to perform even more precise and minimally invasive procedures. Robotic surgery is a minimally invasive technique that allows the surgeon to control surgical instruments through a console, offering greater precision and control during the procedure (SILVA *et al.*, 2015).

Despite the benefits of minimally invasive approaches, it is important to note that these techniques require specific skills and training on the part of surgeons, and not all patients are eligible for this type of procedure. The choice of the most appropriate surgical technique should be made on a case-by-case basis, considering the individual characteristics of each patient and the type of procedure to be performed.

Thus, the evaluation of the efficacy and safety of new minimally invasive approaches in surgeries becomes essential for the improvement of clinical practice and the improvement of surgical techniques. Clinical studies and economic evaluations are important to determine the applicability and cost-effectiveness of these techniques, while patient satisfaction must be evaluated to ensure the quality of care provided.

Therefore, this study aimed to evaluate the efficacy and safety of new minimally invasive approaches in surgeries, focusing on their clinical applicability and benefits for patients. The specific objectives are: to identify and analyze the new minimally invasive approaches used in different types of surgeries; analyze clinical outcomes and cost-effectiveness of using minimally invasive approaches; reflect on patient satisfaction with new minimally invasive approaches.

METHODS

To achieve the objectives of this research, a literature review was conducted in order to identify the new minimally invasive approaches used in different types of surgeries and to evaluate the clinical results of these approaches.

This chapter presents an evaluation of new minimally invasive approaches in surgery through a review study, using the qualitative method. The review was chosen because it is an effective resource for summarizing the empirical or theoretical literature on a given topic, offering an easier understanding of the subject to the reader.

The steps followed in this review were: identification of the problem, search of the databases, evaluation of the data, analysis of the data and presentation of the results (WHITTEMORE & KNALF, 2005). The guiding question adopted for the development of this review was: What is the scientific evidence related to the evaluation of new minimally invasive approaches in surgeries?

For data collection, the following databases/databases were consulted: Latin American and Caribbean Health Sciences Literature (Lilacs), via the Ministry of Health's Virtual Health Library, *Scientific Electronic Library Online* (SciELO), *Medical Literature Analysis and Retrieval System Online* (Medline), *Scopus, Cumulative Index to Nursing and Allied Health* (Cinahl) and *Web of Science*. The search was conducted between January and March 2023.

RESULTS

Studies published in the last 10 years were selected. The inclusion criteria were: studies that evaluated the efficacy and safety of new minimally invasive approaches in surgery. Exclusion criteria included studies that did not present clinical outcomes or that did not address minimally invasive approaches.

The results of this analysis were obtained based on the reading and analysis of the 16 articles selected for discussion. It was possible to observe that minimally invasive surgery is a technique on the rise, being used in several areas of medicine, such as cardiac surgery, gynecology oncology, treatment of periodontal bone defects, treatment of endometrial cancer, among others.

Among the selected studies, a variety of minimally invasive surgical approaches were identified, such as video-assisted thoracoscopy, porto-access surgery, myocardial revascularization, and minimally invasive mitral valve surgery. These techniques offer significant benefits to patients, such as shorter recovery time, less postoperative pain, shorter hospital stay, and a lower incidence of complications.

Some of the selected studies reported the use of innovative technologies, such as augmented reality and gamification, for skills training in minimally invasive surgery. These tools can be useful to improve the efficiency and quality of surgeon training (SILVA *et al.*, 2015).

In addition, the comparison between minimally invasive approaches and conventional surgeries was addressed in some of the selected studies. In general, minimally invasive surgery has been shown to be a viable and safe alternative for patients with different pathologies.

As will be discussed in the next section, the analysis of the selected articles indicates that minimally invasive surgery is a promising technique, with great potential to improve the quality of life of patients undergoing surgical procedures in several areas of medicine. Innovative technologies can be used to improve the training of surgeons and improve surgical techniques.

DISCUSSION

Minimally invasive surgery (IMC) has gained more and more space in surgical practice, providing benefits to patients, such as less pain, hospitalization time, and faster recovery. Among the various specialties, IMT has been used in cardiac, oncological and orthopedic surgeries.

Mohr *et al*. (1998) present the technique of minimally invasive surgery for mitral valve repair. The minimally invasive approach was performed through small incisions in the skin, allowing direct access to the mitral valve without the need for sternotomy. The results presented were positive, with shorter hospital stay, less bleeding and faster recovery compared to conventional surgery.

In a similar vein, Amorim *et al*. (2015) presented a study on the use of IMC in gynecology oncology, highlighting that this approach is safe and effective in selected cases, providing shorter hospital stay, less postoperative pain, and better aesthetic results.

To assess the importance of the technique, Rodrigues and Barreto (2014) conducted a systematic review on the use of biomaterials in minimally invasive surgical approaches for the treatment of periodontal bone defects. The authors highlight the importance of biomaterials in tissue repair, and the use of these materials can facilitate minimally invasive surgery, reducing the need for more invasive and aggressive techniques.

In addition to the practical studies, the analysis also deals with the minimally invasive approach in surgeries as a teaching methodology. Paiz (2014), for example, presented a critical analysis of the development of an e-book to teach minimally invasive surgery in abdominal wall hernias. The author pointed out that the use of educational technologies can improve teaching and learning in minimally invasive surgery, enabling a more complete and up-to-date training of surgeons.

Ferreira *et al.* (2020) presented a study on coronary artery bypass grafting. The researchers discuss the minimally invasive approach as a safe and effective option for certain cases, with shorter hospital stay and less surgical trauma. In the same area of expertise, Zica *et al.* (2020) conducted a comparative analysis between conventional and minimally invasive cardiac surgery in tertiary

hospitals in the Federal District. The authors highlighted that minimally invasive surgery may be a safe and effective option in certain cases, with shorter hospital stay and less bleeding.

Another study that shows the effectiveness of the method is by Miranda (2019). The researcher presented a new approach to transnasal sphenopalatine ganglion block for the treatment of postdural puncture headache, highlighting the use of minimally invasive techniques for the treatment of certain pathologies.

To strengthen the use of this approach, Silva *et al.* (2015) propose the association of the technique with other technological resources. In their study, the authors looked at the use of augmented reality and gamification for laparoscopic skills training, underscoring how the use of these technologies can improve the efficiency and quality of surgeon training.

In the field of minimally invasive cardiac surgery, research addresses the minimally invasive approach to cardiac procedures, including mitral valve surgery and coronary artery bypass grafting. These studies indicate that the minimally invasive approach can offer results comparable to standard sternotomy techniques, with shorter recovery time, shorter hospital stay, and lower postoperative morbidity (JATENE *et al*., 1997; CHITWOOD *et al*., 1997; CASTRO NETO *et al.*, 2012; GAMMIE *et al*., 2010).

However, the study by Grossi *et al.* (2001) reveal that the long-term outcomes of minimally invasive mitral valve surgery are still uncertain and that additional studies are needed to determine whether there are significant differences in long-term survival and clinical outcomes compared with the standard sternotomy approach.

In the field of minimally invasive general surgery, authors Monteiro (2015) and Anjos (2017) address the minimally invasive approach to the treatment of gastrointestinal stromal tumor and endometrial cancer, respectively. Both studies highlight the benefits of minimally invasive surgery, including shorter hospital stays, lower postoperative pain, and faster recovery. However, the study by Rocco *et al.* (2008) shows in his research that there is still significant variability in the practice of minimally invasive thoracic surgery, which can affect the results and efficacy of treatment.

Overall, studies indicate that the minimally invasive approach may offer many benefits for patients, including faster recovery, lower morbidity, and reduced length of stay. However, more research is still needed to assess the long-term outcomes of minimally invasive surgery compared to standard techniques and to identify best practices for minimally invasive surgery in different surgical specialties.

CONCLUSION

Based on the articles analyzed, it can be concluded that the minimally invasive approach in cardiac and thoracic surgeries presents promising results and is a safe alternative for patients.

Minimally invasive coronary artery bypass grafting, for example, has shown good results with the use of video-assisted thoracoscopy and suture stabilizer. In addition, the minimally invasive approach in the treatment of endometrial cancer and gastric GIST has been shown to be efficient and with a shorter recovery time.

Regarding valve surgeries, studies have shown that the minimally invasive approach is feasible and safe, with shorter hospital stays and faster recovery. Based on these results, it can be stated that the minimally invasive approach has been shown to be an advantageous option in relation to median sternotomy in several surgeries, providing better results and greater comfort for patients.

REFERENCES

1. Amorim, A. G., et al. (2015). Uso da cirurgia minimamente invasiva em ginecologia oncológica. *Femina, 43*, 203.

2. Anjos, M. M. (2017). *Cirurgia minimamente invasiva no tratamento do cancro do endométrio* [Tese, Universidade de Coimbra].

3. Castro Neto, J. V., et al. (2012). Cirurgia valvar mitral e da comunicação interatrial: abordagem minimamente invasiva ou por esternotomia. *Arquivos Brasileiros de Cardiologia, 99*, 681.

4. Chitwood, J. R., et al. (1997). Video-assisted minimally invasive mitral valve surgery. *The Journal of Thoracic and Cardiovascular Surgery, 114*, 773.

5. Ferreira, A. S., et al. (2020). Cirurgia de revascularização do miocárdio: uma abordagem minimamente invasiva. *Revista Eletrônica Acervo Científico, 13*, e4658.

6. Gammie, J. S., et al. (2010). Maxwell Chamberlain Memorial Paper for adult cardiac surgery: less-invasive mitral valve operations: trends and outcomes from the Society of Thoracic Surgeons Adult Cardiac Surgery Data-base. *The Annals of Thoracic Surgery, 90*.

7. Grossi, E. A., et al. (2001). Minimally invasive versus sternotomy approaches for mitral reconstruction: comparison of intermediate-term results. *The Journal of Thoracic and Cardiovascular Surgery, 121*, 708.

8. Jatene, F. B., et al. (1997). Cirurgia de revascularização do miocárdio minimamente invasiva: resultados com o uso da videotoracoscopia e do estabilizador de sutura. *Brazilian Journal of Cardiovascular Surgery, 12*, 233.

9. Miranda, R. V. (2019). *Uma nova abordagem do bloqueio transnasal do gânglio esfenopalatino para tratamento da cefaleia pós-punção dural* [Tese, Universidade de São Paulo].

10. Mohr, F. W., et al. (1998). Minimally invasive port-access mitral valve surgery. *The Journal of Thoracic and Cardiovascular Surgery, 115*, 567.

11. Monteiro, S. A. (2015). A abordagem minimamente invasiva no tratamento do GIST gástrico. *Revista Portuguesa de Cirurgia*.

12. Paiz, F. (2014). *Análise crítica do desenvolvimento de livro eletrônico no ensino da cirurgia minimamente invasiva em hérnias da parede abdominal* [Dissertação, Universidade Positivo].

13. Rocco, G., et al. (2008). The variability of practice in minimally invasive thoracic surgery for pulmonary resections. *Thoracic Surgery Clinics, 18*, 235.

14. Rodrigues, W. J. P. R., & Barreto, E. M. (2014). Abordagens cirúrgicas minimamente invasivas para tratamento de defeitos intraósseos. *Perionews, 8*, 422.

15. Semm, K. (1983). Endoscopic appendectomy. *Endoscopy, 15*, 59.

16. Silva, L. F., et al. (2015). Avaliação do uso de realidade aumentada e gamificação para o treinamento de habilidades em laparoscopia. *Brazilian Symposium on Computers in Education*, 627.

17. Swanson, S. J., et al. (2012). Video-assisted thoracoscopic lobectomy is less costly and morbid than open lobectomy: a retrospective multiinstitutional database analysis. *The Annals of Thoracic Surgery, 93*, 1027.

18. Whittemore, R., & Knafl, K. (2005). The integrative review: updated methodology. *Journal of Advanced Nursing, 52*, 546.

19. Zica, M. C. R., et al. (2020). Cirurgia cardíaca convencional x minimamente invasiva–uma análise comparativa em hospitais terciários do Distrito Federal. *Programa de Iniciação Científica-PIC/UniCEUB-Relatórios de Pesquisa*.

Management of statin-related muscle pain: Clinical strategies in patients at high cardiovascular risk

https://doi.org/10.56238/sevened2024.005-011

Erika Mourão Alves Silva[1], Denis Kleber Holanda Guerra[2], Marine Praciano Costa[3], Flávio Gifoni Siebra de Holanda[4], José Walter Lima Prado[5], João Victor Maia Piauilino[6], Marcos Paulo Costa Vilela[7], Francisco do Nascimento Moura Neto[8], Isabelle Oliveira Maceda[9], Pedro Henrique Pinheiro Dantas[10], Jady Braga Fernandes[11], Vinícius de Medeiros Moreira[12], Marcio Alberto Pinto Nunes Junior[13], Ianne Lima Xavier de Almeida[14], Alesson Miranda Farias[15], Matheus Custódio Vieira Braga[16], Larissa de Queiroz Gomes[17], Sâmia Quirino da Silva[18], João Victor Marinho Pereira[19], Larissa Gonçalves Barbosa[20], Cristian Rocha Hidalgo[21], Kauany Sousa Aguiar[22], Lara Rodrigues Saunders de Castro[23], Natália Maria Figueiredo Campos[24], Bruna Drebes[25], David Sandro Araújo[26], Ana Yasmin Tomás Ananias[27], Clarissa Oliveira Lopes[28], Maria Beatriz Mendes de Sousa[29], Akidauanna Sales Bezerra Soares[30], Eduardo Vichnevski Frota[31], Yarla Gurra Saldanha[32], André Luiz Cardoso Gomes[33] and Marilea dos Santos Carvalho[34]

[1] E-mail: erika_mourao77@hotmail.com
[2] E-mail: dennys_guerr@hotmail.com
[3] E-mail: marinepracianoc@gmail.com
[4] E-mail: flaviogifoni1@gmail.com
[5] E-mail: Zwalter.Prado@hotmail.com
[6] E-mail: Maiapiauilino19@outlook.com
[7] E-mail: marcosvilelamed@gmail.com
[8] E-mail: frmouraneto2809@gmail.com
[9] E-mail: isabelleoliveira193@hotmail.com
[10] E-mail: Pedropdantas3004@gmail.com
[11] E-mail: jadybragaf@gmail.com
[12] E-mail: vniciusmoreira@icloud.com
[13] E-mail: Marcioalbertojr@hotmail.com
[14] E-mail: iannelimaxa@hotmail.com
[15] E-mail: alessonfisio@gmail.com
[16] E-mail: matheus.braga1999@hotmail.com
[17] E-mail: larissagomesq1223@gmail.com
[18] E-mail: Samiaquirino2000@gmail.com
[19] E-mail: joaovictormarinhop@outlook.com
[20] E-mail: lahbarbosa45@gmail.com
[21] E-mail: cristiano1474@gmail.com
[22] E-mail: kauany.aguiar11@outlook.com
[23] E-mail: larasaunders14@gmail.com
[24] E-mail: nataliamfc13@gmail.com
[25] E-mail: bruna.drebes@gmail.com
[26] E-mail: Rodriguesdavid.sandro@hotmail.com
[27] E-mail: anayasmintomasananias@gmail.com
[28] E-mail: clarissaolopes@gmail.combeatriz
[29] E-mail: mendesbeatriz114@gmail.com
[30] E-mail: akidauannasalesbezerrasoares@gmail.com
[31] E-mail: Eduardovichnevski@gmail.com
[32] E-mail: Yarlaguras@gmail.com
[33] E-mail: andrelcg98@gmail.com
[34] Advisor and Master's student in Neurosciences at AARON UNIVERSITY
E-mail: mary9leya@gmail.com

ABSTRACT

This book chapter examines the relationship between statin use and statin-induced myalgia, emphasizing the importance of effective management strategies. It aims to identify the main symptoms, evaluate risk factors, mechanism of action and especially explore alternative treatments, including the association of statins with vitamin D. The methodology involved a descriptive and qualitative literature review focusing on databases such as Scielo, Google Scholar and PubMed, from 1996 to 2024. The results show the need for personalized approaches in treatment, considering individual variability in response to medication. It is concluded that in-depth understanding and careful management are crucial to improve treatment adherence and quality of life for patients.

Keywords: Adverse effects of statins, Statin-induced myopathy, Management of statin-related myalgia, Interaction of vitamin D with statins.

INTRODUCTION

Statins are the main class of drugs used to lower serum cholesterol concentration for primary and secondary prevention of cardiovascular disease. (Rosenson et al., 2024). Although they are generally well accepted, it is important to be aware of possible side effects, such as muscle aches or weakness, cramps, and rarely rhabdomyolysis. Statin-associated myopathy is one of the most common adverse effects observed, and is usually reversible with discontinuation or dose reduction (Iwere, R., et al. 2015).

According to Rallidis et al. (2012), muscle pain, which is usually symmetrical and affects proximal muscles, is the most frequent manifestation of statin-related myopathy, usually occurring without elevation in creatinine kinase (CK) levels. It is important to highlight that the pathophysiological mechanism behind this condition is still unknown and considered multifactorial. In clinical practice, about one-third of patients using statins have muscle complaints that can be exacerbated by physical exercise (PEBMED, 2018). In addition, risk factors include drug interactions and patient characteristics. In this context, ensuring the uninterrupted progress of treatment depends heavily on the effective management of these pains.

This study is a vital study due to the increasing use of statins and the associated incidence of myopathy, affecting treatment adherence and quality of life of patients, seeking to identify specific symptoms, explore personalized management options, and investigate the potential role of vitamin D in the prevention of statin-induced myopathy, contributing to more effective and safer clinical strategies.

GENERAL OBJECTIVE

To identify effective clinical strategies in the management of muscle pain in patients treated with statins.

SPECIFIC OBJECTIVES

The specific goals outlined to achieve this goal include: identifying the main symptoms of statin-induced myopathy, such as muscle pain, weakness, and cramps; to evaluate the risk factors associated with the occurrence of muscle pain in patients treated with statins; review diagnostic and monitoring strategies for early detection of drug-related myopathy; explore therapeutic alternatives for the management of muscle pain, including dose adjustment, statin change, or use of adjuvants; and to investigate the relationship between serum vitamin D levels and the development of statin-induced myopathy, evaluating statin-induced vitamin replacement as a possible intervention. These specific objectives will serve as a solid foundation for the study and will contribute significantly to

improving the diagnosis and alternative management of statin-related myalgia, offering new perspectives for effective and personalized treatments for patients.

METHODOLOGY

The present work consists of a literature review that sought to address results found in research on the theme in question, either in a comprehensive, orderly or systematic way. Focal points include symptomatology, risk factors, diagnostic methods, alternative therapies, and the impact of vitamin D.

The inclusion criteria for this view include specifically investigating statin-induced myopathy, diagnostic and monitoring techniques, therapeutic interventions, and the correlation between vitamin D. Any studies that do not directly address these aspects or focus on other statin-related complications will be excluded.

To carry out the search, several electronic databases will be used, such as Google Scholar, Scielo and PubMed. The keywords chosen will align with the specific objectives of the study and will include terms such as "Statin Adverse Effects," "Statin-Induced Myopathy," "Management of Statin-Related Myalgia," "Vitamin D Interaction with Statins," and other pertinent terms.

The study selection process will follow a qualitative and descriptive methodology. Initially, abstracts that seem to meet the inclusion criteria will be identified. Subsequently, the full articles will undergo a thorough review to assess their adequacy and relevance to the objectives of the study. Throughout the data extraction process, information pertaining to the occurrence of statin-induced myopathy will be collected, including documented symptoms, diagnostic approaches, and the effectiveness of various treatment strategies.

When assessing the quality of studies, their methodological rigor, clinical significance, and timeliness will be carefully considered. It is important to note that this review will only cover articles published from 1996 to 2024, which may result in the exclusion of previous research, but ensures that the information analyzed is current and relevant. In addition, the analysis will be limited by the specific terms and languages used in the searches, potentially leading to the omission of pertinent studies that do not align with the designated keywords.

RESULTS AND DISCUSSIONS

According to Paschoalino and Toazza (year), statins, a hydroxymethylglutaryl (HMG) CoA reductase inhibitor drug, have proven to be effective in reducing the risk of cardiovascular events such as heart attacks and strokes, mainly reducing cholesterol levels in patients with dyslipidemia. These drugs are recommended for patients with cardiovascular risk factors and have been shown to

be effective in both primary and secondary prevention of these events. It is crucial for patients to adhere to their statin treatment regimen to achieve optimal therapeutic outcomes.

Available statins include lovastatin, pravastatin, simvastatin, fluvastatin, atorvastatin, rosuvastatin, and pitavastatin, all of which occupy a portion of the HMG CoA binding site, blocking access of this substrate to the enzyme's active site (Istvan ES, et al. 2001), resulting in an increased rate of hepatic Low-Density Lipoprotein (LDL) receptor cycling (Ness GC et al. 1996). This means that under the influence of statins, LDL receptors in the liver are reused at a higher rate, thus allowing for more efficient removal of LDL, or "bad cholesterol," from the blood.

Normally, statins by blocking HMG CoA reductase, a specific pathway in the liver, which is essential for the production of cholesterol, also affects the production of certain important substances called geranyl pyrophosphate and farneyl pyrophosphate, which play a crucial role in regulating vital functions in muscle cells. When the production of these substances is reduced, it can result in changes in muscle function and communication, thus leading to the occurrence of pain.

Symptoms of statin-induced myalgia and myopathy usually manifest as muscle weakness and/or pain that symmetrically affects proximal muscles. Patients may also experience muscle tenderness and functional limitations, such as difficulty performing tasks such as raising the arms above the head, getting up from a sitting position, or climbing stairs. These symptoms are often described by patients as fatigue or tiredness. In some cases, the discomfort may be asymmetrical. Additional symptoms reported include cramping (including nocturnal cramps), stiffness, and pain in the tendons. It is noteworthy that not all patients with these symptoms will have elevated serum creatine kinase (CK) levels.

According to GELATTI (2016), risk factors related to myalgia secondary to the use of statins include advanced age (> 80 years), female gender, low body mass index, chronic systemic disease, use of multiple drugs, alcohol use, and strenuous physical exercise.

In addition, people's response to statins may be influenced by their individual genetics, as some patients have genetic variations that make them more likely to develop muscle soreness when using statins. This may be related to how their bodies absorb and process the drug.

According to Khan (2022), the clinical evaluation of statin-associated myalgia involves distinguishing symptoms directly attributable to statin use from other symptoms that cause muscle pain. This includes a detailed review of the patient's medical history and symptoms, consideration of other potential causes of muscle pain, and the use of objective measures such as creatine kinase levels. Trials in which patients switch between statins and placebo are particularly useful in determining whether symptoms are actually related to statins.

Smith CC (2003) stated that, despite the increased risk of myopathy associated with statin therapy, routine monitoring of serum creatine kinase (CK) levels is not recommended based on a

retrospective study of more than 1,000 patients in primary care practices. There were no obviously abnormal CK values, and only two moderately abnormal CK values may be related to statin use. However, it is useful to obtain baseline serum CK before initiating statin therapy as a reference at symptom onset.

According to a study by Alonso R (2019), to avoid premature discontinuation of statins due to muscle pain in high-risk patients, it is critical to emphasize the proven cardiovascular benefits of statins in patients. Lifestyle changes, such as diet modification, exercise, and smoking cessation, play a key role in lowering cholesterol levels and improving other cardiovascular risk factors, thereby helping to reduce it. Several statin-based strategies have been proposed to control muscle symptoms, such as switching to another statin, reducing the dose (withdrawal) or frequency (intermittent dosing), or repeating the same statin therapy. If the new approach is well tolerated, the dose can be increased gradually to achieve LDL-C targets with little or no muscle discomfort. For patients who cannot tolerate daily statins, dosing every other day or twice a week is a viable option. Rosuvastatin and atorvastatin have a longer half-life and can therefore be used part-time. For patients who reported muscle symptoms to their doctors, the most common recommendation was to switch to another statin.

If statins are not well tolerated, alternative cholesterol-lowering agents, alone or in combination with the maximum tolerated dose of statin, are recommended to achieve LDL-C targets. Ezetimibe is preferred when added to lower doses of statins or alone, and can reduce LDL-C by 20% and is generally well tolerated.

If ezetimibe is insufficient to meet LDL-C goals, consider adding a fibrate. Fibrates reduce LDL-C levels by approximately 15%, and their cardiovascular benefits have been demonstrated in an analysis of randomized controlled trials in patients with hypertriglyceridemia. However, because of the potential for myopathy, the use of gemfibrozil with statins should be avoided. In this context, fibrates such as fenofibrate are preferred as they have a lower risk of adverse interactions.

In addition, Hou Q (2022) showed that vitamin D (25OHD) levels were significantly lower in patients with statin-associated myopathy compared to patients without myopathy and patients with vitamin D deficiency and muscle intolerance to statins, vitamin D supplementation can increase the statin tolerance rate to 89%. Taken at first glance, these results suggest an association between low 25OHD levels and statin-induced myopathy and evidence that vitamin D supplementation may help improve statin-related muscle intolerance in patients with hypovitaminosis D. However, these results are mixed and more research is needed to confirm this association and better understand the underlying mechanisms.

FINAL THOUGHTS

This study highlights risk factors for statin-induced myalgia, which include older age, female gender, low body mass index, and strenuous exercise. In addition, it depicts alternative management that involves adjusting the dose of statins or switching them to types that are less likely to cause myalgia. In addition, alternate-day administration is a viable option. It was evidenced that the combination with ezetimibe was also shown to be effective, offering a further reduction in LDL-C levels with fewer muscle adverse effects. In addition, research points out that vitamin D supplementation may be beneficial for patients with vitamin D deficiency and muscle intolerance to statins. Future research should explore more individualized strategies for the management of statin-induced myalgia, considering genetic and metabolic variations in patients. It is also important to further investigate the relationship between vitamin D deficiency and statin tolerance. In this sense, the search for predictive markers of statin intolerance and the development of new lipid-lowering agents with a lower incidence of muscle side effects are other promising fields. Therefore, this research may lead to a better understanding and management of statin-related myalgia, expanding therapeutic options and improving patients' quality of life.

REFERENCES

1. Iwere, R., & Hewitt, J. (2015). Miopatia em idosos recebendo terapia com estatinas: uma revisão sistemática e metanálise. *Revista britânica de farmacologia clínica, 80*(3), 363-371. https://doi.org/10.1111/bcp.12687.

2. Rallidis, L., Fountoulaki, K., & Anastasiou-Nana, M. (2012). Gerenciando o risco subestimado de miopatia associada à estatina. *Revista Internacional de Cardiologia, 159*(3), 169-176. https://doi.org/10.1016/j.ijcard.2011.07.048.

3. Rosneson, R. S., Baker, S. K., Freeman, M. W., & Swenson, S. Estatinas: ações, efeitos colaterais e administração. *UpToDate, 2024*. Disponível em: https://www.uptodate.com/contents/statin-muscle-related-adverse-events?search=miopatoa%20e%20estatina&source=search_result&selectedTitle=1%7E150&usage_type=default&display_rank=1. Acesso em: 20 de março de 2024.

4. PEBMED. (2018, 29 de janeiro). Estatinas afetam o desempenho muscular esquelético mesmo em pacientes assintomáticos. Disponível em: https://pebmed.com.br/estatinas-afetam-o-desempenho-muscular-esqueletico-mesmo-em-pacientes-assintomaticos/.

5. Paschoalino, J. B., & Toazza, F. T. Uso de estatina em pacientes com risco cardiovascular: uma revisão de literatura. *Brasil Escola*. Disponível em: https://monografias.brasilescola.uol.com.br/saude/uso-de-estatina-em-pacientes-com-risco-cardiovascular-uma-revisao-de-literatura.htm. Acesso em: 20 de março de 2024.

6. Sathasivam S, Lecky B. (2008). Statin induced myopathy. *BMJ, 337*, a2286. https://doi.org/10.1136/bmj.a2286.

7. Jacobson TA, Cheeley MK, Jones PH, et al. (2019). The STatin Adverse Treatment Experience Survey: Experience of patients reporting side effects of statin therapy. *J Clin Lipidol, 13*(3), 415-424. https://doi.org/10.1016/j.jacl.2019.04.011.

8. Istvan ES, Deisenhofer J. (2001). Structural mechanism for statin inhibition of HMG-CoA reductase. *Science, 292*(5519), 1160-1164. https://doi.org/10.1126/science.1059344.

9. Ness GC, Zhao Z, Lopez D. (1996). Inibidores da biossíntese do colesterol aumentam a degradação proteica do receptor de LDL hepático. *Arch Biochem Biophys, 325*(2), 242-248. https://doi.org/10.1006/abbi.1996.0030.

10. Bruckert E, Hayem G, Dejager S, et al. (2005). Mild to moderate muscular symptoms with high-dosage statin therapy in hyperlipidemic patients--the PRIMO study. *Cardiovasc Drugs Ther, 19*(6), 403-414. https://doi.org/10.1007/s10557-005-5686-z.

11. Gelatti, G. T., Mori, N. C., Horn, R. C., & Oliveira, K. R. (2016). Estatinas na Prevenção de Doenças Cardiovasculares. *Revista da Universidade Vale do Rio Verde, Três Corações, 14*(1), 286-292. Disponível em: https://dialnet.unirioja.es/servlet/articulo?codigo=5344017. Acesso em: 20 de março de 2024.

12. Khan, S. U., & Kleiman, N. S. (2022). Sintomas musculares relacionados à estatina: é hora de mexer no BMJ 2022? *BMJ, 379*, o2939. DOI:10.1136/bmj.o2939.

13. Smith, C. C., Bernstein, L. I., Davis, R. B., Rind, D. M., & Shmerling, R. H. (2003). Screening for statin-related toxicity: the yield of transaminase and creatine kinase measurements in a primary care setting. *Arch Intern Med, 163*(6), 688-692. https://doi.org/10.1001/archinte.163.6.688.

14. Alonso, R., Cuevas, A., & Cafferata, A. (2019). Diagnosis and Management of Statin Intolerance. *J Atheroscler Thromb, 26*(3), 207-215. https://doi.org/10.5551/jat.RV17030.

15. Hou, Q., Pang, C., & Chen, Y. (2022). Associação entre vitamina D e miopatia relacionada à estatina: uma metanálise. *Sou J Cardiovasc Drogas, 22*(2), 183-193. DOI: 10.1007/s40256-021-00492-8. EPub 2021 23 jul. PMID: 34296397.

Case report: Thigh sarcoma as a differential diagnosis of soft tissue collections

https://doi.org/10.56238/sevened2024.005-012

Randyston Brenno Feitosa[1], Maria Alexandra de Carvalho Meireles[2], Gustavo Tinarelli Lessi[3], Karna Mireya Braga Cipriano Gomes[4], Rafaela Rodrigues de Sousa Gonçalves[5], Gustavo Borges Castanheira[6], Soraya Batista de Moraes[7] and Rodrigo Padilla[8]

ABSTRACT

Only around 1% of malignant tumors in adult patients are soft tissue sarcomas, but they have high rates of unfavorable outcomes. Based on the high prevalence of pathologies in the daily life of hospital emergencies that may have a similar clinical presentation, it is difficult to reach this diagnosis in the first doctor-patient contacts, with the need for great expertise on the part of the doctor to correctly manage the case.

Keywords: Sarcoma, Neoplasia, Collection.

[1] Resident in General Surgery Institution: Santa Casa de Votuporanga
E-mail: randystonfeitosa@hotmail.com
[2] Post-Graduate in Trichology Institution: Arnaldo Gavazza Hospital
E-mail: marimeirelles27@gmail.com
[3] Resident in General Surgery Institution: Santa Casa de Votuporanga
E-mail: gustavo.lessi@hotmail.com
[4] Resident in General Surgery Institution: Santa Casa de Votuporanga
E-mail: karlasiprianogomes@gmail.com
[5] Resident in General Surgery Institution: Santa Casa de Votuporanga
E-mail: rafaelarodriguessg@gmail.com
[6] Resident in General Surgery Institution: Santa Casa de Votuporanga
E-mail: gustavo.b.c@hotmail.com
[7] Resident in General Surgery Institution: Santa Casa de Votuporanga
E-mail: sorayamoraes.med@gmail.com
[8] Medical Residency in Proctology Institution: Santa Casa de Votuporanga
E-mail: rodrigopadilla@msn.com

INTRODUCTION

Soft tissue sarcomas account for less than 1% of all malignant tumors in adult patients[1]. These tumors can be present in any age group and develop in any part of the human body, composing a heterogeneous group with more than 100 subtypes of neoplasms[2]. Based on the low prevalence of these tumors and the differential diagnosis with other emergency surgical pathologies, we chose to report this case.

CASE REPORT

LFG patient, female, 65 years old, complained of pain and bulging in the medial aspect of the right thigh started about 1 week ago, associated with an isolated febrile peak. Report of low back pain with irradiation to the ipsilateral lower limb in the last month, with no significant findings during orthopedic evaluation.

Physical examination revealed a painful bulge of about 12 cm in diameter on the medial aspect of the right thigh, associated with local heat, with no other findings.

However, there were no significant findings on laboratory tests, however, on US and CT scans, a large intramuscular expansive lesion was found in the right thigh, with an apparent origin near the heterogeneous adductor muscles, with cystic/necrotic areas in between, with partially circumscribed borders, with heterogeneous contrast enhancement, measuring approximately 13.8 x 8.8 x 13.0 cm. No signs of bone invasion. Associated with edema and densification of the subcutaneous tissue of the region.

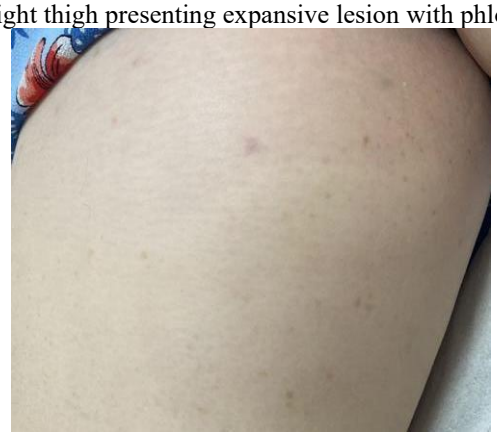
An incision was made at the affected site to drain the collection, showing clots associated with a fibrous capsule in the middle and persistent bleeding during tissue resection.

The patient had a good clinical evolution and was discharged from the hospital after 1 day postoperatively, with outpatient follow-up where the patient and companion were informed of the anatomopathological result, which showed mesenchymal malignant neoplasm compatible with high-grade sarcoma (high mitotic index) associated with hematoma and referral to the referral service for oncological treatment.

Figure 1: Disproportion between right thigh and left thigh

Source: The authors collection.

Figure 2: Right thigh presenting expansive lesion with phlogistic signs



Source: The authors collection.

DISCUSSION

Soft tissue sarcomas are a group of pathologies that, despite their low prevalence in Brazil, have a high potential for fatal outcomes and can progress to metastatic disease in up to 50% of cases and, of these, about 80% will progress to death within 2 years[1]. These tumors have diverse clinical presentations, and may develop superficially or deeply into the tissues, evolve slowly or quickly, and be painless or even extremely painful, making early diagnosis and treatment even more difficult[3].

REFERENCES

1. Voltan, K., Baptista, A. M., & Etchebehere, M. (2021). Sarcomas de partes moles nos membros, mais comuns e tão graves quanto os sarcomas ósseos. *Revista Brasileira de Ortopedia*, *56*(4).

2. Kirane, A., & Crago, A. M. (2016). The importance of surgical margins in retroperitoneal sarcoma. *Journal of Surgical Oncology*, *113*(3), 270–276.

3. Park, J. H., Kang, C. H., Kim, C. H., Chae, I. J., & Park, J. H. (2010). Highly malignant soft tissue sarcoma of the extremity with a delayed diagnosis. *World Journal of Surgical Oncology*, *8*, 84.

Protocols and guidelines for the care of respiratory emergencies in children up to two years of age: An integrative review

https://doi.org/10.56238/sevened2024.005-013

Paula da Silva Fernandes[1], Lucas Benedito Fogaça Rabito[2], Carolina Amadeu Fecchio[3], Júlia Fernanda Ferreira do Nascimento[4], Cremilde Aparecida Trindade Radovanovic[5], Luana Cristina Bellini Cardoso[6], Ivi Ribeiro Back[7], Roberta Tognollo Borotta Uema[8] and Thamires Fernandes Cardoso da Silva Rodrigues[9]

ABSTRACT

Objective: To analyze guidelines and protocols for the care of respiratory emergencies in children up to two years of age in the literature. Methodology: this is an integrative review of the literature, using the guidelines of the PRISMA Protocol, the research question was formulated based on the PICo strategy (P – Children up to two years of age, I – Guidelines and protocols for respiratory emergencies, Co-Emergency): What is the evidence available in the literature on the guidelines and protocols for respiratory emergency care in children up to two years of age? Contemplating the studies published from January 2018 to July 2023, available in full, focusing on protocols for children up to two years of age with no lower age limit, not restricting language, place of origin or method used. Articles found in the databases with the Virtual Health Library (VHL), Cochrane Library. Embase, Pubmed, Scopus, Web Of Science to the use of the RAYYAN® program. Results: four studies included the sample, including the affirmation of the use of poractant alfa for the treatment of severe acute respiratory syndrome in children under two years of age, with an improvement in the mortality rate of 20.4%. The efficacy and fundamental use of hospital medical materials for the management of the advanced airway and reduction of surgical management is proven, reducing the patient's exposure to unnecessary events. And the use of specific medication for the treatment of cases of anaphylaxis and asthma in the first hour. Continuing education training is essential for team harmony, assertive communication and provision of intensive care in order to reduce damage and possible vital complications leading to death. Final considerations: interventions for the clinical management of pediatric respiratory emergencies should follow the ABCDE evaluation method, considering the specificities of each stage of development (less than 30 days, up to one year, up to two years). The administration of surfactant to children younger than 30 days of age is noteworthy, with the potential to reduce the mortality of infants with severe acute respiratory syndrome, and the rigorous evaluation of the indication for orotracheal intubation.

Keywords: Nursing, Emergency, Pediatric Respiratory Distress Syndrome, Respiratory Distress Syndrome of the Newborn, Clinical Protocols, Evidence-Based Practice.

[1] Nurse. Specialist in Urgent and Emergency Care. Universidade Estadual de Maringá (UEM), Maringá, PR, Brazil.
[2] Nurse. Master's student in Nursing, Graduate Program in Nursing, State University of Maringá (UEM), Maringá, PR, Brazil.
[3] Nurse. Master's student in Nursing, Graduate Program in Nursing, State University of Maringá (UEM), Maringá, PR, Brazil.
[4] Undergraduate student of Nursing at the Program. Department of Nursing, State University of Maringá (UEM), Maringá, PR, Brazil.
[5] Nurse. Dr. in Health Sciences. Professor, Department of Nursing and Graduate Program in Nursing, State University of Maringá, Maringá, PR, Brazil.
[6] Nurse. Dr. in Nursing. Professor, Department of Nursing, State University of Maringá, Maringá, PR, Brazil.
[7] Nurse. Dr. in Nursing. Professor, Department of Nursing, State University of Maringá, Maringá, PR, Brazil.
[8] Nurse. Dr. in Nursing. Professor, Department of Nursing, State University of Maringá, Maringá, PR, Brazil.
[9] Nurse. Dr. in Nursing. Professor, Department of Nursing, State University of Maringá, Maringá, PR, Brazil.

INTRODUCTION

Emergencies are defined based on an unforeseen health problem with or without risk to life, requiring immediate care. Emergency consists of occurrences in which there is an imminent risk to life or great suffering requiring immediate care (CFM, 95). Emergency rooms and emergency rooms are the *care loci* that receive individuals in urgent and emergency situations, who require specific assistance for the return of life stability (Ribeiro *et al*., 2019).

Pediatric emergencies often occur due to respiratory diseases, and are considered a public health problem, since infections are recurrent and seasonal, with a higher prevalence in winter. In this sense, climatic variations contribute to the emergence and/or worsening of respiratory diseases in children. Cold and dry air irritates the upper airways, generating symptoms of runny nose, nasal congestion and shortness of breath, increasing the risk of seeking urgent and emergency services (Joshi *et al*., 2020).

The Acute Respiratory Infections (ARIs) that most affect children are asthma, community-acquired pneumonia, especially respiratory syncytial virus, human rhinovirus, influenza, parainfluenza, and adenovirus (Neto *et al*., 2018). AKI signs are identified by parents through cough associated with hyperthermia (Joshi *et al*., 2020).

In developing countries, pediatric care for lower respiratory tract infections predominates, due to their living conditions and hygiene. In developed countries, the hospital setting is characterized by respiratory diseases of viral etiology (Rahim *et al*., 2023). In Brazil, there is a prevalence of children complaining of cough and fever (Silva *et al*., 2021).

Respiratory emergencies in children cause about four million deaths annually in children under five. Worldwide, in 2015, 920,136 deaths due to pneumonia were described, representing 15% of deaths in this age group (Souza *et al*., 2020). In Brazil, between 2009 and 2018, there were 18,902 deaths of children associated with respiratory problems, with a mortality coefficient of 0.64 deaths per thousand live births, with the highest mortality rates observed in the Southeast (34.96%) and Northeast (30.67%) regions (Souza *et al*., 2020).

The nursing team is among the professionals who stand out in the care of children in urgency and emergency (Oliveira *et al*., 2020). According to the National Policy for Emergency Care (PNAU), nursing professionals should perform the reception, risk classification, diagnosis and care necessary for the sick person (Brasil, 2011).

In the face of pediatric respiratory emergencies, nursing professionals have the duty to have technical-scientific competence to act effectively and in a timely manner, impacting on a better prognosis for the individual (Flores *et al*., 2020). Law No. 7,498, of July 25, 1986, provides for the practice of nursing: nurses must coordinate the actions to be performed by the members of the

nursing team, following guidelines for their execution, assisting in the team's care plans for pediatric emergencies, raising safety and readiness for care (Brasil, 1986).

Nurses should apply pathophysiological knowledge through anamnesis and physical examination, combined with the use of protocols during pediatric care (Santos *et al*., 2020). In this sense, pediatric emergency care requires the understanding of anatomical and physiological singularities, which change with child development (Collet *et al*., 2020). However, there is a gap in the literature regarding the development of exclusive risk classification protocols for children in urgent and emergency situations, which may compromise the care provided to children. Added to this is the scarcity of protocols for respiratory emergencies, infections that contribute to increasing morbidity and mortality rates in the world. Between 2015 and 2016, infant mortality rates increased again after 26 years, with an increase of 5.3% in the country (UNICEF, 2019).

In view of the above, the importance of using protocols for the care of pediatric respiratory urgencies and emergencies is evidenced, in order to qualify care, promote quality of life and the well-being of children. In addition to fostering welcoming and humanization throughout the care process. Thus, the objective of this study is to analyze the literature on guidelines and protocols for the care of respiratory emergencies in children up to two years of age.

METHODOLOGY

TYPE OF STUDY

This is an integrative review of the literature, which followed the guidelines of the PRISMA Protocol (Moher *et al*. 2009). The research question was formulated based on the PICo strategy (Hulley; Newman; Cummings, 2015): (P – Children up to two years of age, I – Guidelines and protocols for respiratory emergencies, Co-Emergency): What is the evidence available in the literature on guidelines and protocols for respiratory emergency care in children up to two years of age?

STUDY SELECTION

The following inclusion criteria were adopted: original articles, published in the last five years (between January 2018 and July 2023, a period selected in order to detect the most recent publications), available in full electronically, with a focus on children aged less than or equal to two years, the language, the location of origin of the productions and/or the method used were not restricted. The exclusion criteria were: articles that diverge from the reflections proposed by this study, literature reviews/reflections, editorials, brief communication, clinical trial projects, abstracts of annals, theses, dissertations, course completion work, epidemiological bulletins, management reports, books and articles that did not provide the abstract.

DATA COLLECTION

Data collection took place between April and July 2023, using the following terms included in the *Medical Subject Headings* (MeSH): Nursing, Emergency Room; Child health; Respiratory Distress Syndrome, Pediatric; Infantile Respiratory Distress Syndrome; Protocol, Clinical. In the search strategies PUBMED, EMBASE, SCOPUS, Web of Science and Cochrane. In the Virtual Health Library (VHL) through the Health Sciences Descriptors (DeCS): Emergency Nursing; Pediatric Respiratory Distress Syndrome; Respiratory Distress Syndrome of the Newborn; Clinical Protocols. It is noteworthy that for this collection, only the keywords were used, discarding the synonyms presented. In order to enhance the retrieval of articles, a cross-search between keywords was used by means of the Boolean connector "AND", adopting the same combination in all search locations. Data collection was carried out by two researchers, in a different way, and the disagreements were discussed until there was a consensus.

DATA ANALYSIS AND PROCESSING PROCEDURES

The articles were selected and identified in three stages: 1) Reading the titles and abstracts of the studies and excluding those that did not fit any of the criteria; 2) Full reading of all articles selected in the first stage; 3) Selection of works that fit the eligibility criteria. It should be noted that duplicate articles in the databases were excluded after reading them in full in order to avoid exclusion errors.

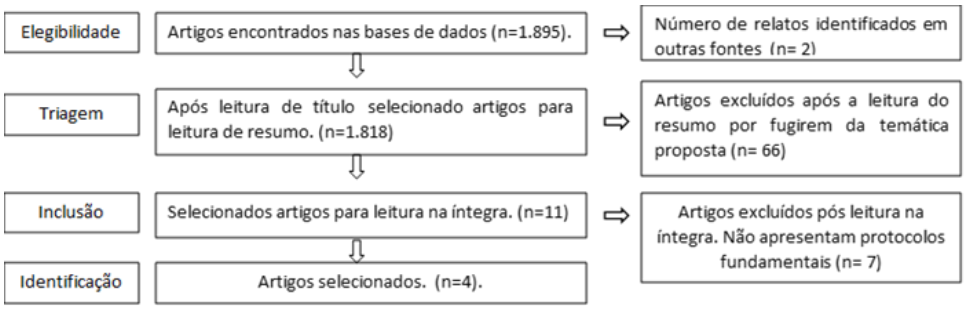
To facilitate the extraction of the information contained in the studies, RAYYAN,® a free *online software*, was adopted, used to assist in conducting systematic and integrative reviews, by exporting the data from the databases, creating a selection of information from the articles that facilitate their selection, namely: identification, title, year of publication, indexing base, journal, level of evidence, Objective, *study design*, main results, and conclusion. To identify the level of evidence of the selected works, the criteria proposed by Galvão (2006) were adopted: level I systematic reviews or meta-analyses of Randomized Controlled Trials (RCTs); level II: evidence obtained from at least one well-designed RCT; level III: well-designed clinical trials without randomization; level IV from well-designed case-control and cross-sectional studies; level V obtained from systematic reviews of descriptive or qualitative studies; level VI from a single descriptive or qualitative study; and level VII: evidence originating from the opinion of authorities and/or expert committees.

The results were structured in tabular format and the data were discussed according to the literature. Ethical aspects were preserved, and all authors of the articles included in this review were appropriately referenced.

RESULTS AND DISCUSSION

A total of 1,895 articles were found in the search strategies, and after applying the eligibility criteria, four articles that covered the research question were selected.

Figure 1. Flowchart of the selection of articles that contemplated was under review of the literature. Maringá, PR, Brazil, 2024. (n=4)



None of the studies selected for this review were developed in Brazil or even in South America, demonstrating the scarcity of productions on the subject. The articles were published in English (n=4). Table 1 shows the characterization of the articles included in this review.

Table 1. Characterization of the articles that included the integrative literature review. Maringá, PR, Brazil, 2024. (n= 4)

ID	Title	Authors	Year of publication	Country	Tongue	Level of evidence
A1	A shared protocol for porcine surfactant use in pediatric acute respiratory distress syndrome: a feasibility study	Wolfler, Andrea; PLATE, Mark; Amigoni, Ângela; SANTUZ, Pierantônio; Gitto, Eloísa; Rossetti, Emanuel; Tinelli, Carmim; Montani, Cinzia; Savron, Fábio; Pizzi, Simone; D'amato, Luigia; Mondardini, Maria Cristina; Conti, Giorgio; De Silvestri, Annalisa	2019	Italy	English	6
A2	Evaluation of a program resuscitation training neonatal care professionals healthcare in Zanzibar, Tanzania: a pre-post intervention study	Ding, X.; Money, L.; Msellem, M.I.; Hu, Y.; Qiu, J.; Liu, S.; Zhang, M.; Zhu, in.; Latur, J.M.;	2021	Tanzania	English	3

A3	European Resuscitation Council Guidelines 2021: Paediatric Life Support	Van de Voorde, P.; Turner, N.M.; Djakow, J.; de Lucas, N.; Martinez-Mejias, A.; Biarent, D.; Bingham, R.; Brissaud, O.; Hoffmann, F.; Johannesdottir, G.B.; Lauritsen, T.; Maconochie, I.	2021	Belgium	English	
A4	Airway emergency management in a pediatric hospital before and during the COVID-19 pandemic	Christopher S. Thom; Hitesh Deshmukh; Leane Soorikian; Ian Jacobs; John E. Fiadjoe; Janet Lioy	2020	USA	English	6

Source: the authors (2024).

The studies included preterm newborn children up to two years of age, with weight ranging from less than one kilogram to more than four kilograms. Other relevant information about the studies is shown in Table 2.

Table 2. Information on the studies included in this review (objective, method, main results). Maringá, PR, Brazil, 2024. (n=4)

ID	Objective	Method	Main Results
A1	To evaluate the use of a protocol on the use of *poractant alfa* in Acute Respiratory Distress Syndrome (ARDS) in children under two years of age.	Multicenter observational study	69 children received treatment with poractant alfa for the treatment of respiratory syndrome. 54 children had severe ARDS. 11 children died, 10 had complex comorbidities. Two children died during extracorporeal membrane therapy (ECMO). Mortality rate: 20.4%.
A2	To evaluate a neonatal resuscitation training program delivered over a two-year period to health care workers in Zanzibar, Tanzania.	Intervention study (pre-post intervention)	Through the training and education of 23 health professionals over two years, an increase in knowledge, care and management of children in Cardiorespiratory Arrest was obtained. The team's performance in the face of complications over the years increased from 32.26 to 42.23.
A3	Provide guidelines on the management of critically ill infants and children, before, during, and after cardiac arrest.	Guidline	Multiprofessional material for the management of infants and children through interventions such as the use of adrenaline for cases of anaphylaxis. Corticosteroid administration in the first hour when the asthmatic state occurs. Score verbal and non-verbal communication in order to provide

			appropriate assistance. Harm reduction in life-threatening emergencies that could lead to cardiorespiratory arrest.
A4	To evaluate the effect of a Neonatal and Infant Airway Emergency Program to improve medical responses, communication, equipment use, and outcomes for all infants requiring emergent airway interventions in the neonatal and infant intensive care unit (NICU).	Retrospective cross-sectional study	With the use of the program, the number of events remained constant, being approximately 12 cases per year. All new cases were treated with the necessary equipment and specialists. Emphasis on the use of the flexible fiber-laryngoscope and the Benjamin laryngoscope in emergency events. The use of a bronchoscope has helped to reduce surgical management due to greater airway protection.

Source: the authors (2024).

The main (general) interventions in respiratory emergencies for children under two years of age are shown in the table below and followed the ABCDE method of approach to critically ill patients, with the specificities arising from age being pointed out (Chart 1).

Table 1. Interventions for the emergency care of children under two years of age. Maringá, PR, Brazil, 2024. (n= 4)

ABCDE Method Evaluation	**Interventions**
The Establish airways	- Keep them pervious, and vacuum when necessary; alignment and tilt of the head and jaw, alignment of the body; - If unconscious, consider it an invasive airway with an orthotracheal tube of adequate size, avoiding pushing the tongue back during insertion; - If semi-conscious, consider nasopharyngeal airway to avoid if skull base fracture is suspected.
B Respiration	- Check respiratory rate: up to 30 days (upper limit of normal 60 breath movements per minute (mpm), lower limit of normal 25 mpm), up to one year (upper limit of normal 50 mpm, lower limit of normal 20 mpm), up to two years (upper limit of normal 40 mpm, lower limit of normal 18 mpm); - Abnormal sounds accompanied by retractions (notch and/or accessory muscles), grunts; thoracic expansion; Oxygenation; consider the use of capnography and thoracic ultrasonography; - Provide oxygen to achieve target saturation of 94% or more (with as little supplemental FiO2 (fraction of inspired oxygen) as far as possible); - Not administering preventive oxygen therapy; - Initiate oxygen therapy at high FiO2 based on clinical signs of circulatory or respiratory failure, and titrate oxygen therapy as soon as SpO2 and/or PaO2 (Partial Pressure of Oxygen) becomes available; - Consider high-flow nasal cannula (HFNC) or non-invasive ventilation (NIV) for children who do not respond to low oxygen flow; - In hypoxemic children despite Positive End Expiratory Pressure (PEEP) (elevated (>10 cmH2O) and standard optimization measures, consider permissive hypoxemia (reduced oxygenation target for SpO2 88–92%); - Mechanical Ventilation: adjust respiratory rate (and expiratory time) and/or tidal volume (CV) according to age. Use a VT of 6 to 8 ml/kg LW (ideal body weight), considering, among others, the physiological and apparatus dead space (especially in younger children). The dead space of the appliance should be minimized. Look for normal chest elevation. Avoid hyperinflation as well as hypoventilation.
C Circulation	Check pulse rate - up to 30 days (upper limit of normal 180 bpm, lower limit of normal 110 bpm), up to one year (upper limit of normal 170 bpm, lower limit of normal 100 bpm), up to two years (upper limit of normal 160 bpm, lower limit of normal 90 bpm);

	- Capillary filling time; - Urine output; - Level of consciousness; - Assess preload: jugular veins, palpation of the liver, crackles; - Check blood pressure - up to 30 days (systolic blood pressure - upper limit of normal 75 mmHg, lower limit of normal 50 mmHg), up to one year (upper limit of normal 95 mmHg, inferring limit of normality 70 mmHg); - Consider collection of laboratory tests and lactate serials and cardiac ultrasound;
D **Disability**	- Verify the level of consciousness using the Glasgow Coma Scale (GCS): ≤8 (level of consciousness incompatible with reflexes that can preserve the airway), AVPU (Verbal-Pain-Unresponsive); - Size, symmetry and photoreaction to light; - Recognize the seizure as a neurological emergency. - Check capillary blood glucose if consciousness is altered and/or potential hypoglycemia. Collection in the calcaneal region avoiding the central area, - When hypoglycemia is present (50-70 mg/dl or 2.8-3.9 mmol/L). It should be treated with maintenance glucose (6-8 mg/kg/min) or orally (0.9 g/kg tablet or equivalent) plus carbohydrate. - If hypoglycemia is (<50mg/dl (2.8 mmol/L) with neuroglycopenic symptoms, it should be performed in two ways, the first using 0.3 g/kg bolus IV glucose in 10% or 20% solution. In the absence of IV glucose, IM or SC glucagon (0.03mg/kg or 0.5mg <25kg or 1 mg >25kg) is used. - Retesting is required 10 minutes after the end of treatment. Targeting above 50 mg/dl and focus blood glucose of 100 mg/dL. - Sudden unexplained neurological symptoms, especially those that persist after resuscitation, neuroimaging should be performed urgently.

Source: the authors (2024).

In order to assist teams working in emergency units that care for children under two years of age, the main materials that should be available in the service for airway management were collected from the literature (Chart 2).

Table 2. Materials used for Orotracheal Intubation (OTI) of children under two years of age that should be available in emergency units. Maringá, PR, Brazil, 2024. (n= 4)

Airway equipment	**Other equipment**
Direct laryngoscopy handles and slides (size 00, 0, 1)	Notification system and telephones for the entire hospital
Videolaryngoscopy cables, blades and monitors (size 0, 1)	Personal protective equipment (gown, gloves, N95 masks, surgical masks)
Benjamin Laryngoscopes	Viral filters for in-line use (15mm inner diameter, 22mm outer diameter)
Flexible fiber-optic laryngoscopes and monitor tower (2.2 mm and 2.8 mm with suction)	
Endotracheal tubes (2.0, 2.5, 3.0, 3.5, 4.0)	
Alligator tweezers (large, small)	
Tracheostomy surgical set with traditional neonatal and pediatric size (size 1, 1.5) and nasopharyngeal (sizes 6.5-8.5) tracheostomy tubes.	
Laryngeal mask (traditional and intubation MLs, sizes 1, 1.5)	
Nasopharyngeal airway (sizes 6.5–8.5)	

Source: the authors (2024).

Among the resources used for the management of respiratory emergencies in children, especially newborns, the use of surfactant was evidenced. In study A1, the surfactant used was poractant alfa, administered to premature infants with pulmonary dysplasia on mechanical ventilation with plateau pressure < 30 cmH2O and PEEP ≥5 cmH2O. The surfactant is administered according to the age of the child, for those under one month, it is recommended to use 100mg/kg diluted in 0.9% saline solution in a ratio of 1:2 to be administered via tracheal cannula. When the child is more than 30 days old, its use occurs in two stages: starting with washing with a solution of 20mg/kg diluted in saline solution until obtaining a solution of 4 to 5 ml/kg, whose purpose is to remove inflammatory mediators, generating the whitening of the alveoli and bronchi. The second dose will be prepared at 30mg/kg diluted in saline solution in a 1:2 ratio with the aim of restoring endogenous surfactant (A1).

The literature shows that the milestone in the reduction of newborn mortality occurred in the 80's after the early use of surfactants. Prematurity can favor the development of severe acute respiratory syndrome, as well as peri-intraventicular hemorrhages, tension pneumothorax, pulmonary dysplasia, sepsis, and even death due to the lack of exogenous surfactant (Oshiro *et al*., 2023).

A study identified that the administration of surfactant through the tracheal route has greater efficacy in the distribution of newborns with severe acute respiratory syndrome (Rebello *et al*., 2015). For children using continuous positive airway pressure (CPAP), surfactant should be administered through a thin catheter, with the aid of a laryngoscope introduced into the trachea, avoiding the use of positive pressure under the airways. However, this technique requires sedation, resulting in depression of the respiratory system and consequent intubation, and the use of a laryngeal mask is an alternative. It is reiterated that in Brazil, the laryngeal mask can only be used by children weighing more than two kilograms (Oshiro *et al*., 2023).

The studies included in this review presented clinical protocols that address the management of severe conditions that represent the main causes of respiratory emergencies in children: respiratory failure, asthmatic status, and anaphylaxis (A1, A3). For the management of respiratory failure (RI), initially the cervical should be aligned and airway patency established, and orotracheal aspiration should be performed only if necessary and carefully (A3). It is essential to administer low-flow oxygen, if there is no good response, choose oxygenation via high-flow nasal cannula or non-invasive ventilation in the presence of RI or hypoxemia (A1). Due to the immaturity of the nervous system of infants, whose response consists of activation of the parasympathetic system, hypoxemia, and bradycardia, it is essential that professionals are able to manage the airways properly (Gomes *et al*., 2022).

The results highlighted the relevance of rigorously evaluating the indication for orotracheal intubation and mechanical ventilation of each child (A3). The literature establishes the use of an endotracheal tube with cuff when the child has lung disease associated with reduced lung compliance

or increased resistance, and cuff pressure should be maintained between 20 and 25 cm of H2O, in order to reduce the risks of aspiration and tracheal injury (Gomes *et al*., 2022).

When the child is unconscious, the route of choice for airway management should be oropharyngeal intubation with a cannula of appropriate size for the child. In the case where the child is semi-conscious, opt for nasopharyngeal intubation, except in cases where skull base fracture or coagulopathy is suspected (Gomes *et al*., 2022).

Differing from these findings, a study indicated the use of videolaryngoscopy as the standard technique for all intubations, as it reduces the risk of injury to the airway handled in the emergency room (Borges *et al*., 2022). The alternative use of direct laryngoscopy with *Macintosh* or videolaryngoscopes is used in difficult airways and/or if intubation fails, as it allows visualization of the airway without the need to perform the alignment of the oral and pharyngeal axes, reducing the force used and the movement of the cervical spine. Thus, intubations with videolaryngoscopy have a high number of successful intubations in the first attempt (Mandal *et al*., 2015).

Study A3 suggests the use of the DOPES acromion for the evaluation of children on mechanical ventilation who suddenly deteriorate their clinical condition, as follows: D – displacement of the orotracheal tube or mask; O - obstruction of pipe, circuit, via area; P - pneumothorax; E – equipment (oxygen, pipes, fittings, valves); and S - stomach (abdominal compartment). Orotracheal intubation may result in the introduction beyond the Carina of the Trachea, generating bronchial selectivity, or be introduced into the esophagus escaping from the airway. Obstruction due to torsion, foreign body, secretion, or blood may occur. Pneumothorax and finally, there may be a failure in the ventilation system, such as interruption in the power supply, disconnection of the oxygen source or circuit, preventing ventilation exchange and gas exchange from being effective (Gomes *et al*., 2022).

Asthma flare-up is associated with a higher chance of developing respiratory failure among infants due to hypoxemia caused by the disease. Thus, children who have an oxygen saturation of less than or equal to 92% should be hospitalized, and those with a saturation below 90% require more aggressive treatment (Pastorino *et al*., 2021).

A key point is the recognition of the severe crisis, which occurs through anamnesis and physical examination, in addition to the determination of pulmonary function, arterial blood gas analysis (due to compensation, initially the partial pressure of carbon dioxide (PaCo2) may be normal or reduced) and chest X-ray (A3). Similar data were found, since the indication of tests to evaluate children with asthma are situations in which the clinical picture does not respond to treatment or there are complications (Pastorino *et al*., 2021).

The Brazilian Ministry of Health determines that the diagnosis of asthma in children is clinical, through the evaluation of birth history and possible previous respiratory infections. The

allergic version is the most prevalent in childhood, and may be associated with the allergic disease passed on by its descendants, such as eczema, allergic rhinitis, food or drug allergies (Brasil, 2021).

The treatment described consists of the administration of oxygen in order to maintain saturation between 94% and 98%, the use of a short-acting beta-2 agonist, by means of spacers, such as the use of albuterol (2.5–5 mg, 0.15mg/kg) which has a half-life between two and four hours, associated with an anticholinergic such as ipratropium bromide (0.25–0.5 mg) which has a short-acting half-life (A3). In this aspect, divergences have been noted in the literature, since salbutamol may trigger a vasodilation effect superior to bronchodilation, and may worsen oxygen saturation parameters after its administration in the first 30 minutes (Pastorino *et al*., 2021).

Within the first hour of treatment, systemic corticosteroids (prednisolone 1–2 mg/kg, with a maximum of 60 mg/day) should be administered. The use of corticosteroids in treatment is due to their effect on reducing inflammatory cells by inhibiting the production and survival of eosinophils, T lymphocytes, mast cells, dendritic cells, and chemotactic mediators, with efficacy in reducing symptoms and asthmatic exacerbation (Ramadan *et al*., 2019).

There are two forms of treatment, dual and triple therapy, the first is the management of asthma attacks with the use of inhaled corticosteroids associated with long-acting agonist β (LABAs) or the combination of both and the addition of long-acting muscarinic antagonists (LAMAs) in more severe cases as the first choice or without improvement after the use of dual therapy. When compared, triple therapy leads to improved asthma control and a decrease in severe symptoms, a lower number of non-serious adverse events, but no difference in quality of life or mortality (Rosenberg, 2021).

When a serious and life-threatening event occurs, it is necessary to use intravenous magnesium sulfate in a single dose of 50 mg/kg for 20 minutes (maximum dose of two grams). In children, isotonic magnesium sulfate can also be used as a nebulized solution (2.5 ml of 250 mmol/l; 150 mg) (A3). The use of magnesium sulfate helps in the treatment of severe asthma, due to its effect on the relaxation of smooth muscle tissues, through the inhibition of calcium and myosin ligament and by blocking cholinergic neuromuscular transmission that excites muscle fibers, causing a reduction in severity (Wongwaree *et al*., 2022).

The use of nebulization with magnesium sulfate (MgSO4) is an alternative, has a low cost and no adverse effects, making it possible to use it in communities with or without financial resources (Alansari *et al*., 2015). The literature shows that nebulization with MgSO4 is a side effect, the sensation of nasal stinging, and in one case, it evolved to episodes of mild vomiting (Wongwaree *et al*., 2022).

When used early, it may obtain a better outcome with nebulization of MgSO4 when the symptomatology occurs before six hours, reducing the severity from the beginning of treatment

(Wongwaree *et al*., 2022). However, a study conducted with patients who used nebulization with magnesium or placebos resulted in similarities in their behavior in severe cases, with no difference in the duration of treatment or discharge. Concluding that it is rarely an effective treatment (Alansari *et al*., 2015). Anaphylaxis is determined by severe, life-threatening systemic hypersensitivity (Manhães *et al*., 2021) The incidence of anaphylaxis cases ranged from 1-761 per 100,000 people per year, and can be induced by foods such as peanuts, nuts, seafood, and eggs, being more prevalent than those induced by insects or anesthesia. Boys are more susceptible to anaphylaxis than girls when they are younger than 10 years, above this age there is an inversion, and the incidence is even higher among girls (A2).

Deaths due to anaphylactic shock are rare in children under two years of age. Mortality is estimated at 0.05-0.51 per million people per year for drug cases, 0.03-0.32 for food, and 0.09-0.13 for poison-induced (Cardona *et al*., 2020; Turner *et al*., 2017). We found a description of a five-month-old infant, previously diagnosed with cow's milk allergy, who, after ingesting cereal with traces of milk, developed anaphylactic shock and died (Manhães *et al*., 2021).

The articles that make up the review reiterated the importance of identifying anaphylaxis as early as possible in order to start treatment assertively as soon as possible. The medication of choice consists of adrenaline (epinephrine) administered intramuscularly, especially in the vastus lateralis muscle of the thigh (dose 0.01 mg/kg, up to 0.15 mg in children under six years of age), if symptoms do not cease quickly (five to 10 minutes), a second dose of adrenaline may be administered (A3). The recommended route is intramuscular due to its good tolerance, since several patients have a previous history and use the epinephrine pen at the onset of symptoms, reducing the mortality rate. For the use of the intravenous route, the patient must be in a hospital environment, monitored and administered with the aid of a continuous infusion pump, if the aid of other necessary devices or resuscitators is necessary. Incorrect use can lead to fatal arrhythmias (Cardona *et al*., 2020).

In addition to pointing out the interventions that should be part of the clinical protocols for pediatric respiratory emergency care, the studies highlighted the relevance of hospital services instituting continuing education programs that promote the continuous training and updating of multidisciplinary teams that work in the care of children (A2, A4). Training related to cardiopulmonary resuscitation of children is effective when theoretical-practical resources are articulated, eliciting critical and reflective thinking, initiative and empowerment of the team for decision-making in the face of cardiopulmonary arrest in children (A2). The presence of a trained multidisciplinary team helps prevent errors associated with care, increasing patient safety (Matias *et al*., 2021).

The use of tools for quick and effective communication among professionals was also recommended. As an example, the resource used was the pager-type telephone (beeper), activated by

pressing a button that issues a notification alerting professionals about the emergency, thus reducing response time (A3). There are numerous electronic devices for multiprofessional communication in the hospital environment, favoring quick responses and ensuring greater interaction between professionals and patients, which are low cost and easy to handle (Moreira *et al*., 2019). However, the sharing of patient information must be approved in advance, and be carried out under a critical and cautious lens to avoid the patient's worsening and/or even progression to death (Lima *et al*., 2022).

Although this integrative review is relevant, it has important limitations regarding the scarcity of studies developed on the subject, hindering the quantitative analysis of the data, especially the Brazilian scientific production, which is not found for this analysis. Also noteworthy is the heterogeneity of the study designs, with a low level of evidence. Thus, it is necessary to interpret the data sparingly and adapt it to the local reality.

Although it has such limitations, it has the potential to assist health professionals by bringing together protocols and guidelines that can be applied in hospitals, with a view to evidence-based practice and best practices.

FINAL THOUGHTS

The main guidelines for the care of respiratory emergencies in children up to two years of age were compiled and synthesized, configuring them as a subsidy for clinical practice based on scientific evidence. Interventions for the clinical management of pediatric respiratory emergencies should follow the ABCDE assessment method, taking into account the specificities of each developmental phase (less than 30 days, up to one year, up to two years). The administration of surfactant to children younger than 30 days of age is noteworthy, with the potential to reduce the mortality of infants with severe acute respiratory syndrome, and the rigorous evaluation of the indication for orotracheal intubation.

It is reiterated that the small number of articles published on the subject, in line with the low level of evidence of the works, made it difficult to conduct the analysis and presentation of evidence. It is suggested that researchers, especially those who are involved in the practice, develop research, protocols, and clinical trials to reiterate the most effective practices in the management of respiratory emergencies in children, in order to qualify care, improving cost-effectiveness-safety.

REFERENCES

1. Alansari, K., et al. (2015). Nebulized magnesium for moderate and severe pediatric asthma: A randomized trial. *Pediatric Pulmonology*, 50(12), 1191-1199. DOI: 10.1002/ppul.23158. Acesso em: 20 dez. 2023.

2. Brasil. (1986). Lei nº 7.498/86, de 25 de junho de 1986. Dispõe sobre a regulamentação do exercício da Enfermagem e dá outras providências. DOU: Brasília, 1986. Disponível em: https://www.cofen.gov.br/lei-n-749886-de-25-de-junho-de-1986/. Acesso em: 8 jul. 2023.

3. Brasil. Ministério da Saúde. (2011). Gabinete do Ministro. Portaria nº 1.600, de 07 de julho de 2011. Reformula a Política Nacional de Atenção às Urgências e institui a Rede de Atenção às Urgências no Sistema Único de Saúde (SUS). DOU: Brasília, 2011. Disponível em: https://bvsms.saude.gov.br/bvs/saudelegis/gm/2011/prt1600_07_07_2011.html. Acesso em: 2 jul. 2023.

4. Brasil. Ministério da Saúde. (2021). Portaria Conjunta nº14, de 24 de agosto de 2021. Protocolo Clínico e Diretrizes Terapêuticas da Asma. DOU: Brasília, 2021. Disponível em: https://bvs.saude.gov.br/bvs/saudelegis/Saes/2021/poc0014_27_08_2021.html#:~:text=O%20Protocolo%20objeto%20deste%20artigo%2C%20que%20cont%C3%A9m%20o,assistencial%2C%20autoriza%C3%A7%C3%A3o%2C%20registro%20e%20ressarcimento%20dos%20procedimentos%20correspondentes. Acesso em: 14 dez. 2023.

5. Borges, G. D., et al. (2023). Use of videolaryngoscope in intubation reduces complications and improves chance of success. *Brazilian Journal of Health Review*, 5(5), 21702-21716. DOI: 10.34119/bjhrv5n5-307. Acesso em: 14 dez. 2023.

6. Cardona, V., et al. (2020). World allergy organization anaphylaxis guidance. *World Allergy Organ J.*, 13(10), 100472. DOI: 10.1016/j.waojou.2020.100472. Acesso em: 14 dez. 2023.

7. Collet, et al. (2020). *Pediatric Nursing Manual* (3a ed.). Goiana, Editora AB. Acesso em: 9 jul. 2023.

8. Conselho Federal de Medicina (CFM). (1995). Resolução CFM nº 1.451, de 17 março de 1995. Os estabelecimentos de Prontos Socorros Públicos e Privados deverão ser estruturados para prestar atendimento a situações de urgência-emergência. DOU: Brasília, 1995. Disponível em: https://sistemas.cfm.org.br/normas/arquivos/resolucoes/BR/1995/1451_1995.pdf. Acesso em: 2 jul. 2023.

9. Ding, X., et al. (2021). Evaluation of a Neonatal Resuscitation Training Programme for Healthcare Professionals in Zanzibar, Tanzania: A Pre-post Intervention Study. *Front. Pediatr.*, 9:693583. DOI: 10.3389/fped.2021.693583. Acesso em: 26 out. 2023.

10. Flores, P. C. B., et al. (2020). Performance of nurses in child asthmatic bronchitis. *Brazilian Journal of Development*, 6(11), 92559-92569. DOI: 10.34117/bjdv6n11-606. Acesso em: 8 jul. 2023.

11. Galvão, C. M. (2006). Níveis de evidência. *Acta Paulista de Enfermagem*, 19(2), 5. DOI: 10.1590/S0103-21002006000200001. Acesso em: 8 jul. 2023.

12. Gomes, R. S., et al. (2022). Airway management and tracheal intubation in pediatrics: an update. *Rev Med Minas Gerais*, 32(Supl 11), S17-S23. Disponível em: https://www.bing.com/ck/a?!&&p=2862d4b59669eef2JmltdHM9MTcxMjYyMDgwMCZpZ3V

pZD0zZmIyNTI1ZS0xNDQwLTZkNTEtMWY4My00MDkyMTU1NDZjYTkmaW5zaWQ9NTIwMg&ptn=3&ver=2&hsh=3&fclid=3fb2525e-1440-6d51-1f83-409215546ca9&psq=.+Airway+management+and+tracheal+intubation+in+pediatrics%3a+an+update&u=a1aHR0cHM6Ly9ybW1nLm9yZy9leHBvcnRhci1wZGYvMzk1OS92MzJzMTFhMDQucGRm&ntb=1. Acesso em: 10 jan 2024.

13. Mandal, A., et al. (2015). Upper airway obstruction in children. *Indian Journal of Pediatrics*, 82(8), 737-744. DOI: 10.1007/s12098-015-1811-6. Acesso em: 14 dez. 2023.

14. Hulley, S. B., Newman, T. B., & Cummings, S. R. (2015). Introdução: anatomia e fisiologia da pesquisa clínica. In S. B. Hulley (Org.), *Delineando a pesquisa clínica* (4a ed., pp. 2-14). Porto Alegre (RS): Artmed. Acessado em: 22 mai. 2023.

15. Joshi, M., et al. (2020). Climate change and respiratory diseases: a 2020 perspective. *Current Opinion in Pulmonary Medicine*, 26(2), 199-227. DOI: 10.1097/MCP.0000000000000656. Acesso em: 4 jul. 2023.

16. Rosenberg, K. (2023). Triple vc dual inhalation therapy and asthma stage in moderate to severe asthma. *Jam Journal of Nursing*, 121(9), 56. DOI: 10.1097/01.NAJ.0000790636.32742.fc. Acesso em: 20 dez. 2023.

17. Lima, A. L. S., et al. (2022). O uso da tecnologia como ferramenta de assertividade no cuidado de urgência e emergência. *Cadernos de Graduação - Ciências Biológicas e de Saúde Unit*, 7(3), 79-94. Disponível em: https://periodicos.set.edu.br/cadernobiologicas/article/view/8279/5139. Acesso em: 16 dez. 2023.

18. Manhães, I. B., et al. (2021). Anaphylaxis in the first year of life: how to diagnose. *Arquivos Asma Alergia e Imunologia*, 5(3), 255-266. DOI: http://dx.doi.org/10.5935/2526-5393.20210041. Acesso em: 14 dez. 2023.

19. Matias, A. R., et al. (2023). Multiprofessional team interventions in transporting critically ill patients: a systematic mixed-methods review. *Escola Anna Nery*, 26(2). DOI: 10.1590/2177-9465-ean-2021-0452en. Acesso em: 14 dez. 2023.

20. Moher, D., et al. (2009). The PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Medicine*, 6(7), e1000097. DOI: http://dx.doi.org/10.1371/journal.pmed.1000097. Acesso em: 22 mai. 2023.

21. Moreira, A. M. R., et al. (2019). Electronic communication between health professionals in patient assistance: integrative review. *Revista SOBECC*, 24(2), 99-106. DOI: 10.5327/Z1414-4425201900020008. Acesso em: 16 dez. 2023.

22. Neto, H. J. C., et al. (2018). Guidelines of the Brazilian Association of Allergy and Immunology and the Brazilian Society of Pediatrics for surveillance and asthma in preschoolers. *Arquivos Asma, Alergia e Imunologia*, 2(2), 163-208. Disponível em: http://aaai-asbai.org.br/detalhe_artigo.asp?id=868. Acesso em: 4 jul. 2023.

23. Oliveira, F. R. C., et al. (2020). Management of acute respiratory distress syndrome in a child with adenovirus pneumonia: case report and literature review. *Revista Paulista de Pediatria*, 38, e201828. DOI: 10.1590/1984-0462/2020/38/2018280. Acesso em: 14 dez. 2023.

24. Oshiro, C. G. S., & Barreiros, R. C. (2021). Use of exogenous surfactant in prematurity: after forty years, still a current issue. *Revista Faculdade de Ciências Médicas Sorocaba*, 23(2), 32-33. DOI: https://doi.org/10.23925/1984-4840.2021v23i2a1. Acesso em: 13 dez. 2023.

25. Pastorino, A. C., et al. (2021). Practical Update Guide on the treatment of asthma exacerbation in children and adolescents – Joint position of the Brazilian Association of Allergy and Immunology and the Brazilian Society of Pediatrics. *Arquivos Asma, Alergia e Imunologia*, 5(4), 322-345. DOI: http://dx.doi.org/10.5935/2526-5393.20210053. Acesso em: 14 dez. 2023.

26. Rahim, N., et al. (2023). Pediatric Respiratory Emergencies-Recognition, Approach, and Management. *Pediatric Annals*, 52(4), e146-e152. DOI: 10.3928/19382359-20230208-06. Acesso em: 20 dez. 2023.

27. Ramadan, A. A., et al. (2019). Asthma and corticosteroid responses in childhood and adult asthma. *Clinics in Chest Medicine*, 40(1), 163-177. DOI: 10.1016/j.ccm.2018.10.010. Acesso em: 20 dez. 2023.

28. Ribeiro, D. R., et al. (2019). Atención de enfermería en el área de urgencias y emergencias pediátricas. *Revista Artigos. Com*, 10, e2130. Disponível em: https://acervomais.com.br/index.php/artigos/article/view/2130. Acesso em: 9 jul. 2023.

29. Rebello, C. M., et al. (2015). Uso do Surfactante no Recém-Nascido. *I Consenso Brasileiro de Ventilação Mecânica em Pediatria e Neonatologia*. Associação de Medicina Intensiva Brasileira (AMIB). Disponível em: https://www.sbp.com.br/fileadmin/user_upload/2015/02/i_consenso_brasileiro_de_surfactante.pdf. Acesso em: 13 dez. 2023.

30. Silva, B. R., et al. (2021). Profile of children treated at an urgent and emergency service in southern Brazil. *Journal of Nursing and Health*, 11(1), e2111118981. DOI: 10.15210/jonah.v11i1.18981. Acesso em: 4 jul. 2023.

31. Souza, J. B. A., et al. (2020). Brazilian infant mortality due to respiratory diseases in the period from 2009 to 2018. In *Ciências Biológicas e da Saúde: Pesquisas Básicas e Aplicadas* (Cap. 10). Editora Stricto Sensu. Disponível em: https://sseditora.com.br/wp-content/uploads/10-MORTALIDADE-INFANTIL-BRASILEIRA-POR-DOENCAS-RESPIRATORIAS-NO-PERIODO-DE-2009-A-2018.pdf#:~:text=Houve%20um%20total%20de%2018.902%20mortes%20infantis%20por,foi%20o%20ambiente%20hospitalar%20com%2015.476%20%C3%B3bitos%20%2881%2C87%25%29. Acesso em: 9 jul. 2023.

32. Thom, C. S., et al. (2020). Airway emergency management in a pediatric hospital before and during the COVID-19 pandemic. *International Journal of Pediatric Otorhinolaryngology*, 139, 110458. DOI: 10.1016/j.ijporl.2020.110458. Acesso em: 26 out. 2023.

33. Turner, P. J., et al. (2017). Fatal anaphylaxis: mortality rate and risk factors. *Journal of Allergy and Clinical Immunology: In Practice*, 5(5), 1169-1178. DOI: https://doi.org/10.1016/j.jaip.2017.06.031. Acesso em: 20 dez. 2023.

34. UNICEF. (2019). *To childhood and you* (Ano 15, n. 42). Disponível em: https://www.unicef.org/brazil/sites/unicef.org.brazil/files/2019-03/UNI42_RA2018.pdf. Acesso em: 9 jul. 2023.

35. Voorde, P. V., et al. (2021). European Resuscitation Council Guidelines 2021: Paediatric Life Support. *Resuscitation*, 161, 327-387. DOI: 10.1016/j.resuscitation.2021.02.015. Acesso em: 12 set. 2023.

36. Wolfler, A., et al. (2023). A shared protocol for porcine surfactant use in pediatric acute respiratory distress syndrome: a feasibility study. *BMC Pediatrics*, 19, 203. DOI: 10.1186/s12887-019-1579-3. Acesso em: 26 out. 2023.

37. Wongwaree, S., & Daengsuwan, T. (2022). Comparison efficacy of randomized nebulized magnesium sulfate and ipratropium bromide/fenoterol in children with moderate to severe asthma exacerbation. *Asian Pacific Journal of Allergy and Immunology*, 40(1), 31-38. DOI: 10.12932/AP-190717-0118. Acesso em: 20 dez. 2023.

Analysis of clinical characteristics, risk factors and complications associated with Brugada Syndrome: An integrative review

https://doi.org/10.56238/sevened2024.005-014

Ana Carolina Câmara Reis[1], Ana Fernanda Frazão Silva[2], Ana Patricia Lima Rocha Fonseca[3], Barbara Cristina Rodrigues Neres[4], Carlos Eduardo da Silva Sousa[5], Júlia Gabriela da Silva Goiabeira[6], Marcelly Kelmanny da Luz Sampaio[7], Maria Helena Milones da Silva[8], Marcilene de Amorim Sandes[9] and Amanda Castro Barroso Pinheiro[10]

ABSTRACT

Brugada Syndrome is a channelopathy resulting from genetic alterations that influence the regulation of sodium channels in the heart muscle, leading, consequently, to arrhythmias, detected by means of an electrocardiogram with ST-segment elevation, given the variably asymptomatic condition of young people with hereditary development of the disease. The diagnosis, when evidenced through clinical manifestations, occurs through syncope or cardiac arrest. Data were analyzed through an integrative literature review and sampling data didactically represented in weighted base articles. Based on digital researches platforms such as PUBMED, SCIELO, SCOPUS and BVS, it is possible, through inclusion and eligibility criteria, to understand the findings and comparatively understand symptoms, clinical conditions, family members and treatment before the target audience.

Keywords: Brugada syndrome, Channelopathy, Hereditary development.

[1] Student of the Medicine Course at Ceuma University, São Luís-MA
[2] Student of the Medicine Course at Ceuma University, São Luís-MA
[3] Student of the Medicine Course at Ceuma University, São Luís-MA
[4] Student of the Medicine Course at Ceuma University, São Luís-MA
[5] Student of the Medicine Course at Ceuma University, São Luís-MA
[6] Student of the Medicine Course at Ceuma University, São Luís-MA
[7] Student of the Medicine Course at Ceuma University, São Luís-MA
[8] Student of the Medicine Course at Ceuma University, São Luís-MA
[9] Student of the Medicine Course at Ceuma University, São Luís-MA
[10] Physician graduated from the Federal University of Maranhão (UFMA), São Luís-MA

INTRODUCTION

Brugada Syndrome is a hereditary arrhythmogenic disease identified by the presence of specific electrocardiographic features with or without clinical symptoms. In addition, it is important to highlight the anatomical and physiological aspects of the heart in order to add a concept and understanding of this syndrome, which affects mostly young patients, who are at increased risk of sudden death due to ventricular fibrillation (VF). (MILITZ, et al, 2021)

As for the anatomical and physiological aspects, it is legitimate to postulate that the heart has four cavities, two right and two left. The two cavities that are present on the right side receive poorly oxygenated blood from the systemic circulation through the superior and inferior vena cavae, and pump it through the pulmonary artery to the lungs, where it will be oxygenated. The blood then returns to the left atrium through the pulmonary veins, goes to the left ventricle, and, through the aortic artery, returns to the systemic circulation. (BRANCO, et al, 2018).

With regard to Brugada Syndrome, it is worth mentioning that it belongs to a group of channelopathies caused by alterations that occur in genes that encode or regulate the sodium channels of the heart muscle. This pattern of genetic transmission has an autosomal dominant trait with mutations of the SCN5A and SCN10A genes linked to the Brugada phenotype. (MILITZ, et al, 2021).

In addition, the recognition of Brugada Syndrome can be done by means of a 12-lead ECG, demonstrating elevation of the J point in the right precordial leads. However, diagnosing the existence of the syndrome among the general population becomes complicated, since some patients have an unstable Brugada electrocardiographic pattern. (MILITZ, et al, 2021).

As for the risk factors of Brugada syndrome, genetic inheritance can be included, which due to heredity increases the risk of developing the pathology as it is more frequent in men than in women. Brugada syndrome occurs more often in Asians than in people of other races. In addition, an alarming factor that does not cause the syndrome but can irritate the heart and cause fainting or sudden cardiac arrest is fever, especially if it is in children. (Wylie, et al, 2020).

Under these aspects, it is relevant to highlight the complications of this syndrome. Studies show that Brugada syndrome has distinct consequences such as syncope, sudden cardiac arrest, which if not treated immediately, can lead to sudden loss of heart function, breathing and consciousness and which usually occurs during sleep, AF, conduction disorders or pathological mutations, these factors are present in patients with Brugada ECG and also exist in patients with genetic cause of the syndrome. In view of the above, the objective was to analyze the clinical characteristics, risk factors and complications associated with Brugada Syndrome. (Brugada, 2023).

METHODOLOGY

This is an integrative literature review that listed the stages of problem/hypothesis construction, in addition to the general and specific objectives of the review, establishment of inclusion and exclusion criteria for articles (sample), defining the information that was extracted from the selected articles that emerged from research carried out on the clinical characteristic, risk factors and complications associated with Brugada Syndrome.

To define the guiding question, the PVO strategy was used, in which P (population) patients with Brugada Syndrome, V (variable) clinical characteristic, risk factors and complications, and O (Ouctomes/outcome) know the clinical patterns among patients. Thus, the guiding question was established in order to function as a research question or hypothesis. Thus, the question for the direction of this study was: "What are the risk factors associated with eating disorders among college students?" (BIRUEL; PINTO 2011). (TABLE 1).

Table 1: Components of the question according to PVO strategy.

Acronym	Definition	Description
P	Population	Patients with Brugada syndrome
V	Variable	Clinical characteristic, risk factors and complications
Or	Ouctomes/outcome	Know the clinical patterns among patients

Source: authors (2023)

After this stage, data were manually searched in electronic databases of the Virtual Health Library (VHL), namely: Scientif Electronic Library Online (SCIELO), National Library of Medicine (PUBMED) and SciVerse Scopus (SCOPUS). The following descriptors were used, "brugada syndrome", "signs and symptoms", "risk factors", "complications", "diagnostic" to locate the publications. In which they were combined by the Boolean operator AND to relate the search terms. Regarding the study, the following steps were followed: 1) detection of the descriptors by means of the Descriptors in Sciences and Health (DECs), selecting those that were closest to the theme; 2) articles were searched using these descriptors in the databases above, which were in the period from 2013 to 2023; 3) filtration was performed by applying the eligibility criteria for the selection of the articles that were used in this review.

A priori, the titles and abstracts of the articles were read to analyze the publications. The inclusion criteria were those that fit the time frame of the last 10 years, that were in the Portuguese and English languages and that were related to the proposed theme. Those that did not have the full text and did not fit within the required time frame were excluded. The search for the study sample

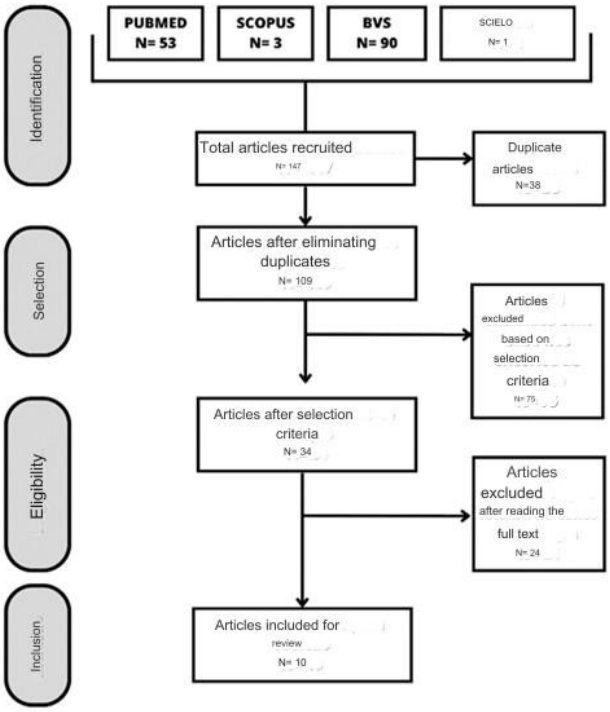
was carried out in March 2023. A flowchart was developed to recognize the methodological path adopted (Figure 1).

The data obtained from the previously selected articles were transcribed into a validity instrument, and this mechanism was adapted to accommodate the study objectives. Instrument that contains variables of interest to the research in question, and its items are composed of: title, authors, year, sample, research location, study objective, method/level of evidence and main results. The proposal described by Melnyk and Fineout-Overholt (2022) was adopted to evaluate the research design and classify the scientific evidence of the article.

RESULTS

A total of 147 articles were identified in electronic databases using the science and health descriptors "Brugada Syndrome", "risk factors" and "signs and symptoms", "complications" and "diagnosis". Of these, 53 were in the PUBMED database, 1 article in SCIELO, 3 articles in SCOPUS and 90 were found in the VHL. After applying the eligibility criteria, 10 articles fit perfectly according to the inclusion and eligibility criteria, relating to the proposed theme, as evidenced in the flowchart based on the PRISMA model (Figure 1).

Figure 1: Methodological path of sample collection



Source: Authors (2023)

Chart 2 – Presentation of the sample according to the variables: title, author, year| sample, location| study objective| method and level of evidence| main results.

Title/ Authors/ year	**Sample/ Location**	**Purpose of the study**	**Method| Level of evidence**	**Main results**
Brugada syndrome. Pedro Brugada. 2023	8 patients	The goal was the discovery of Brugada Syndrome and its risks to the patient	Cross-sectional study	In this article, the syndrome was discovered through 8 patients who showed a very unusual ECG with ST-elevation in the right precordial leads and what appeared to be a right bundle branch block.
Risk stratification of ventricular fibrillation in Brugada syndrome using non-invasive scoring methods; KAWAZOE, Hiroshi et al. 2016.	143 Japanese patients with SBr with VF (n=35) and without VF (n=108).	The aim of this study was to construct a new prediction model for VF risk in patients with RRB using non-invasive parameters.	Cross-sectional study	The frequency of syncope history, spontaneous type 1 ECG, and maximum T-wave alternation were associated with the occurrence of VF in univariate analyses. The new prediction method makes it possible to assess the risk of VF in patients with rBS.
Prevalence of spontaneous ECG pattern type 1, syncope, and other risk markers in survivors of sudden cardiac arrest in Brugada syndrome. LEONG, Kevin MW et al.2019.	133 patients with SBr	Evaluate patients with rSB, based on medical examinations or interviews and through risk factors	Cross-sectional study	A total of 133 patients with rBS were identified, only 8 had episodes of ventricular fibrillation and 2 required cardiopulmonary resuscitation. It was concluded that most patients with the syndrome had no history of previous syncope or risk factors.
Clinical characteristics, management and prognosis of elderly patients with Brugada syndrome. CONTE, Giulio et al. 2014	**437 patients with BS in an elderly population.**	The aim of this study was to investigate the clinical characteristics, management, and prognosis of BS in an elderly population.	Cross-sectional study	In the study, it was found that the elderly have a lower frequency of family history of sudden death compared to young people. However, a familial screening was done among 58 family members most of whom have BS. Therefore, the clinical features and benign prognosis of BS patients older than 70 years are likely to identify a category of patients at lower risk compared to younger individuals.
Syncope in Brugada syndrome: prevalence, clinical significance, and anamnesis clues to distinguish arrhythmic from non-arrhythmic causes.	342 patients with SBr	The aim of this study was to distinguish arrhythmic events from non-arrhythmic syncope in the SBr and to establish the clinical relevance of non-arrhythmic syncope.	Cross-sectional study	One study identified that 23 patients (7%) had ECG-documented ACA and 118 (34%) syncope; of these 118, 67 (57%) were diagnosed with suspected non-arrhythmic syncope. Therefore, non-arrhythmic syncope frequently occurs in BrS and should be considered a risk factor.

NORTH BATTLE, Louise Ra Olde et al.2015				
Number of electrocardiogram leads in the diagnosis of spontaneous Brugada syndrome. ARNAUD, Marinho et al, 2020	1613 patients	To investigate the value of a single-lead diagnosis in patients with Brugada syndrome and a spontaneous type 1 electrocardiogram.	Cross-sectional study	The study among 1613 patients was based on the recently recommended single shunt criterion for the diagnosis of Brugada syndrome, as this disorder can lead to a high risk of sudden cardiac death. However, after research, it is concluded that the number of leads is not necessary for diagnosis.
Fever-induced Brugada syndrome is more common than previously suspected: a cross-sectional study of an endemic area. Ratanwong, Patara et Al, 2016.	401 patients	The aim of this study was to identify the prevalence of fever-induced SRB	Cross-sectional study	A total of 416 patients were included in the study, including all 158 febrile patients and randomly selected 258 non-febrile patients presented to the emergency departments of Buriram Hospital concluded the highest prevalence of fever-induced SBr ever reported.
Low serum levels of eicosapentaenoic acid and docosahexaenoic acid are risk factors for cardiogenic syncope in patients with brugada syndrome. Yagi, Shusuke et al. 2017	62 men	The objective of this study was to verify whether fatty acids are risk factors for cardiogenic syndrome	Cross-sectional study	Serum levels of EPA and DHA were evaluated among these men, and it was concluded that low levels of EPA and DHA are associated with the incidence of syncope in patients with SBr.
Identification of a patient with high-risk Brugada syndrome by combined analysis of late potential and T wave amplitude variability on electrocardiograms. Yoshioka, Koichiro et al. 2013.	127 patients	To evaluate how the electrocardiogram changes in Brugada Syndrome (late potentials and variability of T wave amplitude)	Cross-sectional study	In this study, the research was carried out in the outpatient clinic to investigate how the electrocardiogram behaved in these patients and it was concluded that the analysis of late potentials and the variability of the amplitude of the T wave is useful in the identification of patients with high-risk syndrome.

Arrhythmic events in a patient with Brugada syndrome induced by fever. ROTERBERG, Gretje et al. 2020.	53 patients	The aim of this study is to further explore baseline characteristics and the association of fever with syndrome-related arrhythmic events.	Cross-sectional study	The study did a genetic screening performed on 14 patients (26%) and revealed an SCN5A mutation in 21% of the patients and these were seen that fever symptoms included life-threatening arrhythmia, ventricular fibrillation, tachycardia, syncope and cardiac arrest, concluding that fever is a major risk factor for arrhythmia events in patients with SBr.

DISCUSSION

Brugada syndrome (BS) is a rare autosomal inherited syndrome that leads to an increased risk of sudden death (SC). It mainly affects adult patients with an average age of 45 years, and the prevalence of diagnosis is eight times higher in men (NORDKAMP, *et al.*, 2015)

The clinical presentation of the disease is variable, however, some patients may remain totally asymptomatic. However, arrhythmic syncope is considered one of the most frequent symptoms of BS and this should be considered from the risk stratification since it allows the analysis of electrocardiographic changes, cardiac arrest and cardiogenic syncope, thus avoiding sudden death. In addition, it is also worth mentioning that male patients over 45 years of age are more prone to these events. (OLDE N L R., et al 2015; KRAHN AD., et al, 2022)

Some studies show that one third of patients with BS are diagnosed after symptoms of syncope or cardiac arrest, most of which occur at rest with vagal symptoms or during the night. An increase in the prevalence of atrial fibrillation in BS was evidenced, which highlights the need for screening for BS by the physician, especially for young men. On the other hand, two-thirds of patients with BS are asymptomatic at diagnosis, and one-third of these are identified during family screening. For diagnosis based on a specific ECG pattern, symptoms are not required (NORDKAMP, *et al.*, 2015).

In addition, there are 3 patterns that can be considered characteristic for this syndrome. Pattern 1 is the most common and the one that presents ST segment elevation to more than 2 mm together with T wave inversion in the right precordial leads and J point elevation also above 2 mm. While patterns 2 and 3 have an ST-segment elevation ECG in saddle type (KRAHN AD., et al, 2022). It has been observed that patients with spontaneous type I ECG have twice the risk of arrhythmic events than patients who develop such an ECG pattern when submitted to the use of sodium channel blocking medication. (BRUGADA, et al., 2023).

Previous findings in the literature indicate that implantable cardioverter defibrillators, or ICDs, can actively prevent cardiac events with a worse prognosis in BS, especially in male patients and patients with ventricular arrhythmias that can be induced. However, new studies show that the

use of ICDs is not suitable for all types of patients with this syndrome, since their use is associated with high complications, and is better indicated, for example, for individuals who have survived a cardiac arrest due to ventricular fibrillation or hemodynamically unstable ventricular tachycardia (KAWAZOE., et al, 2016).

It is also noteworthy that in a study that evaluated the clinical characteristics, management, and prognosis of BS in elderly patients, it was found that they more frequently presented, compared to younger patients, some type of conduction disorder of the baseline ECG, in addition to also presenting transient advanced atrioventricular (AV) block before the diagnosis of BS. In addition, it was found that the incidence of AV conduction disorders or advanced AV block was significantly higher in patients over 70 years of age compared to people aged 60 to 70 years (CONTE, *et al.*, 2014).

However, it was identified that elderly patients reported less family history of MS compared to younger patients and had fewer sustained ventricular arrhythmias induced by programmed ventricular pacing. Therefore, the prognosis of BS patients over 70 years of age highlighted a lower risk of complications compared to younger individuals (LEONG, *et al.*, 2019)tag.

As for the treatment, some studies have shown that quinidine and its subcompounds are useful to treat Brugada Syndrome, because quinidine has antiarrhythmic therapeutic properties, in addition to inhibitory power in the action action of potassium during the action potential, especially in phase 2. However, its use can cause diarrhea, significant neurological events, and thrombocytopenia (KRAHN AD., et al, 2022)

CONCLUSION

In view of what has been postulated, it can be observed that Brugada Syndrome (BS) is a hereditary pathology with an arrhythmogenic aspect, with specific electrocardiographic characteristics, with the ECG1 pattern being the most common among them. As for its clinical condition, BS can present both symptomatically and asymptomatically, with arrhythmic syncope and cardiac arrest as its most frequent symptoms. In addition, through the articles included in the present study, it was also possible to analyze the risk factors and the main complications associated with BS, with malignant syncope, history of sudden family death and SCN5A mutation as indicative of risk for the development of this syndrome, whose complications are the ephemeral loss of cardiac function. atrial fibrillation and conduction disorders or pathological mutations.

This integrative review is of remarkable importance for the university environment, since, through the analysis of scientific articles, it is possible to highlight the main risk factors and complications of Brugada Syndrome, in addition to focusing on its most common clinical presentations.

REFERENCES

1. BIRUEL, E. P.; PINTO, R. Bibliotecário um profissional a serviço da pesquisa. In: XXIV Congresso Brasileiro de Biblioteconomia, Documentação e Ciência da Informação. Alagoas: Federação Brasileira de Associações de Bibliotecários, Cientistas de Informação e Instituições, 2011.

2. BRUGADA, P. Síndrome de Brugada: 30 Anos de Aventura Científica. Arquivos Brasileiros de Cardiologia.2023.

3. CONTE, G., et al. Clinical characteristics, management, and prognosis of elderly patients with Brugada syndrome. Journal of cardiovascular electrophysiology, v. 25, n. 5, p. 514-519, 2014.

4. KAWAZOE, H., et al. Risk stratification of ventricular fibrillation in Brugada syndrome using noninvasive scoring methods. Heart Rhythm, v. 13, n. 10, p. 1947-1954, 2016.

5. LEONG, K M W ., et al. Prevalence of spontaneous type I ECG pattern, syncope, and other risk markers in sudden cardiac arrest survivors with Brugada syndrome. Pacing and Clinical Electrophysiology, v. 42, n. 2, p. 257-264, 2019.

6. LEONG, K.M.W., Ng F.S, Jones S, Chow JJ, Qureshi N, Koa-Wing M, Linton NWF, Whinnett ZI, Lefroy DC, Davies DW, Lim PB, Peters NS, Kanagaratnam P, Varnava AM. Prevalence of spontaneous type I ECG pattern, syncope, and other risk markers in sudden cardiac arrest survivors with Brugada syndrome. Pacing Clin Electrophysiol. 2019 Feb;42(2):257-264. doi: 10.1111/pace.13587. Epub 2019 Jan 6. PMID: 30569504.

7. MELNYK, Bernadette Mazurek; FINEOUT-OVERHOLT, Ellen. Evidence-based practice in nursing & healthcare: A guide to best practice. Lippincott Williams & Wilkins, 2022.

8. MILITZ, M. S. et al. Prevalência e Características Relacionadas de Pacientes com Eletrocardiograma com Padrão de Brugada em Santa Catarina, Brasil. Arquivos Brasileiros de Cardiologia. 2021.

9. NORDKAMP, L R A O., et al. Syncope in Brugada syndrome: prevalence, clinical significance, and clues from history taking to distinguish arrhythmic from nonarrhythmic causes. Heart Rhythm, v. 12, n. 2, p. 367-375, 2015.

10. Olde Nordkamp, L.R., Vink, A.S, Wilde, A.A., de Lange, F.J., de Jong, J.S., Wieling W; van Dijk N, Tan, H.L. Syncope in Brugada syndrome: prevalence, clinical significance, and clues from history taking to distinguish arrhythmic from nonarrhythmic causes. Heart Rhythm. 2015. doi: 10.1016/j.hrthm.2014.10.014. Epub 2014 Oct 13. PMID: 25311410.

11. PÉREZ-RIERA, A. R., et al. Síndrome de Brugada: conceitos atuais e antecedentes genéticos. Journal of Human Growth and Development. 2021.

12. Wylie J.V., et al. Brugada syndrome: Prognosis, management, and approach to screening. AskMayoExpert. Brugada syndrome. Mayo Clinic; 2020.

Implementation and management of the intensive care service in the interior of Ceará in times of COVID 19: An experience report

https://doi.org/10.56238/sevened2024.005-015

Diego Bruno Santos Pinheiro[1], Liliane Sousa Borges Pinheiro[2], Viviane Sousa Borges Lima[3], Fernanda Maria Gonçalves[4], Francisco Edson das Chagas Silva[5], Arkila Pinheiro Rodrigues de Sousa[6], Wellington Costa Tomaz[7], Priscila Dias Pinto[8] and Hiasmin Batista Rodrigues[9]

ABSTRACT

This study aims to report the experience regarding the implementation and management of the Intensive Care service in the interior of Ceará because of COVID 19, in the period from March to August 2020. This is a descriptive study of the experience report type. , where the intensive care unit was faced with a new reality of care, as well as with the immediate selection and training of the multidisciplinary team. The structuring and organization of the hospitalization and treatment service included the incorporation of new technologies, the availability of Personal Protective Equipment, awareness about the isolation of an area then critical for the movement of people, and the concomitant selection and training of the team that would provide care to these patients. It should be noted that actions aimed at continuing education in health were fundamental to improve the quality of patient care, strengthening the safe practice of the growing demand for professionals to work in

[1] Nurse, Intensive Care, Urgency and Emergency Specialist
Fortaleza General Hospital-HGF.Brazil
E-mail: diego.pinheiro90@gmail.com
ORCID: https://orcid.org/0009-0001-9247-4013
[2] Nurse, Specialist in pediatric and neonatal nursing. GRAPE
Northern Regional Hospital, Brazil
E-mail: lilianeborgesp@gmail.com
ORCID: https://orcid.org/0009-0006-8099-1351
[3] Nurse, Nursing Specialist, Surgical Center and CME
Northern Regional Hospital, Brazil
E-mail: vivisborges_@hotmail.com
ORCID: https://orcid.org/0000-0003-1067-3201
[4] Nurse, Intensive Care Specialist UECE
Salute Courses and Consulting, Brazil
E-mail: nanda_nursing@hotmail.com
ORCID: https://orcid.org/0000-0003-0610-7741
[5] Specialization in Intensive Care Nursing.
Teresina School of Science and Technology, FACET, Brazil.
Northern Regional Hospital, Brazil
E-mail: edsonsilva8866@hotmail.com
ORCID: https://orcid.org/0000-0001-8114-621X
[6] Pharmacist, Post-graduation in Clinical Pharmacy and pharmaceutical prescription
Sertão Central Regional Hospital, Brazil
E-mail: arkilapinheiror@gmail.com
ORCID: https://orcid.org/0000-0002-0145-3664
[7] Physician.- Post-Graduation in Intensive Care Medicine
Northern Regional Hospital, Brazil
E-mail: wellingtontomaz10@gmail.com
ORCID: https://orcid.org/0009-0006-0238-1582
[8] Nurse, specialist in operating room and sterilization material center
Northern Regional Hospital, Brazil
E-mail: pixilha@hotmail.com
[9] Nurse, Specialization in Urgency, Emergency and ICU from Faculdade Ateneu
Northern Regional Hospital, Brazil
E-mail: hiasmin.6@gmail.com

ICUs. This reality has highlighted some important aspects in the context of the Brazilian health team, such as the inadequate number of professionals, low salaries, and inadequate working conditions. Thus, with the objective of guiding the care provided with excellence, this study shows the importance of a service based on a scientific technical base, the relevance of training and the integration of multidisciplinary team and strengthens the perception of the need to implement and manage an evidence-based service to benefit from management tools, technologies, and knowledge in the care of patients with COVID-19.

Keywords: COVID-19, Intensive care unit, Continuing education.

INTRODUCTION

With the emergence of the new coronavirus, scientifically called Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2), the etiological agent of Coronavirus Disease 2019 (COVID-19), and its rapid global spread, the number of infected people and the demand for health services grew, resulting in an increase in hospitalization rates and individuals requiring intensive care in hospital services (Meneses, 2020).

In Brazil, the first confirmed case of COVID-19 was registered on February 26 in São Paulo, then spread throughout the country. The COVID-19 epidemic was declared a pandemic on March 11, 2020, becoming a serious public health problem (Brasil, 2020).

Epidemiological data for 2021 showed that there were about 240,940,937 confirmed cases of COVID-19, including 4,903,911 deaths, worldwide. As of October 2021, Brazil had 21,664,464 confirmed cases with 603,282 deaths (WHO, 2021).

The world's health care system has collapsed. Even in developed countries with well-structured systems, they were affected, due to the overload in the demand for the treatment of critically ill patients, who required intensive care. Public hospitals often had to opt for rationing of intensive care beds, as health needs increased, but financial resources did not (Massuda et al., 2020).

In hospitakar health services, work is focused on the act of caring, involving a direct link between professional and patient (Dal'Bosco et al., 2020).

In this context, the Intensive Care Units (ICUs), which are characterized as environments of high complexity in the in-hospital environment, with the objective of offering advanced life support for various levels of impairment in critically ill patients, played a role of great relevance and protagonism. Since, in a general context, an ICU provides a specialized facility focused on continuous monitoring, maintenance, stabilization, and improvement of the clinical condition of hospitalized patients on an interrupted basis (Ferreira, 2017).

These circumstances, in addition to directly affecting the work routine of health services, interfering in the schedules and shifts of professionals, also negatively influenced care management and the quality of nursing care, contributing significantly to the intensification of a crisis in the health sector. In this sense, this problem requires professionals to develop their managerial skills and competencies, which consist of articulating and integrating actions, favoring, qualifying, and contextualizing care, in a predictable or planned way (Treviso, *et al*. 2017).

In this context, care practice and management are essential for the organization of work and human resources, as their performance is based on general competencies, which include health care, decision-making, communication, leadership, management, and continuing education (Souza; Axe; Sousa, 2019). These actions direct the activities of professionals in a coordinated and organized

manner towards qualified, comprehensive, and efficient care (Berghetti; Franciscatto; Getelina, 2017).

Thus, the changes, the advances in the scenarios of care practices and the health situation, made the *World Health Organization* (WHO) consider the moment as one of the greatest health crises ever seen in the world, which had repercussions in changes in the organization of teams and work logistics. Thus, these aspects required from the professionals training, specialized knowledge, competencies and managerial skills, as well as experience in the administrative area for the organization of sectors, material resources and equipment, for the recruitment and dimensioning of personnel and assistance (Soares; Resck; Terra, 2016), especially in the midst of these adversities and potential situations that weaken the quality and problem-solving capacity of health care.

Thus, this study aims to report the experience of the implementation and management of the Intensive Care service in the interior of Ceará as a result of COVID 19. from March to August 2020

METHODOLOGY

This is a descriptive study of the experience report type on the implementation and management of the Intensive Care service in a city in the interior of Ceará as a result of COVID 19, which occurred in the period from March to August 2020.

Pereira *et al*. (2018), an experience report is an exploratory study, described by analytical texts referring to the experiences lived in the field, supporting the effectiveness of this research. It is reiterated that the work corresponds to an experience report based on a subjective analysis of the authors.

The study took place in the city of Sobral, located in the North Zone of Ceará, more specifically in the Northern Regional Hospital (HRN) is the largest hospital in the interior of the Northeast Region, with more than 54 thousand square m² of built area, being responsible for serving an estimated population of 1.6 million people, from the 55 municipalities that are part of the Northern macro-region of the State. Tertiary (attends to cases of medium and high complexity). It has 24-hour urgent and emergency care). It is a reference in pediatrics, thoracic surgeries, vascular surgeries, and otorhinolaryngology (Institute of Health and Hospital Management, 2021).

In order to construct subsidies that would guide the implementation and management of Intensive Care Units, a literature review was carried out, based on institutional guidelines and standardizations, as well as recommendations established by the National Health Surveillance Agency (ANVISA) and the Brazilian Association of Intensive Care Medicine (AMIB) for adherence and adequacy of the best evidence for the local reality and pertinent in all stages of the process. In this continuum, the document was evaluated and approved by the Hospital Infection Control Service (SCIH) and approved by the hospital's Quality Management, to which the CC unit is subordinate.

The implementation and management of the service aimed at the care of critical patients with COVID-19 included points from the structuring and organization of the service for the admission and treatment of patients, as well as the incorporation of new technologies, availability and training on the use of Personal Protective Equipment (PPE), awareness about the isolation of an area then critical for the circulation of people and the concomitant action of selection and training of the team that would provide the Assistance to these patients

RESULTS AND DISCUSSION

With the emergence of COVID-19, the health team was faced with a new reality of care, changes in the logistics of services, as well as the need for selection and training of the multidisciplinary team.

The challenges with regard to the management of resources and materials were not trivial, requiring from health services and managers strategies and plans to face this new reality, with contingency measures prepared almost continuously.

For the reorganization and implementation of a new intensive care unit, the first stage consisted of the selection of the members of the multidisciplinary team. Where the main requirement was the choice of professionals with expertise in the area of care for critical patients, however, if there was insufficient of these professionals to compose the service in a comprehensive way, the team was merged, inserting members who would need training in an immersive way about the area and during the shifts it was decided to keep professionals with more experience and others who would need greater supervision.

It is emphasized that the actions aimed at continuing education in health were fundamental to improve the quality of care for patients with the new coronavirus, strengthening the safe practice of the growing demand for professionals to work in ICUs. In addition, the management established among the actions present in the management of the service. channels of dialogue between the multidisciplinary teams in the context of intensive care, which were of fundamental importance in the context experienced.

The pandemic moment required the structuring of Institutional Protocols, based on the Protocols of the Ministry of Health. One of the strategies adopted to disseminate information was educational actions, under the responsibility of the service's most experienced professionals, who took on this great challenge, supported by hospital management, aiming at the systematization of care for the safety of patients and professionals.

According to Ferrari (2020), in addition to respiratory compromises, COVID 19 can cause damage to other systems, including the cardiovascular system, immune reactions, and systemic

inflammatory disorders. Therefore, hemodynamic surveillance of the patient should be intensified in order to avoid or minimize further damage.

In this context of patient and professional safety, the training addressed the following topics: definition of COVID-19, the epidemiological situation of the disease in the world, in Brazil and in Pernambuco, main signs and symptoms, standard precautionary measures, droplets, aerosols and contact, importance of the use of PPE, demonstration of the steps of dressing and undressing, and the step-by-step of hand hygiene.

The clinical severity presented by the patients and the increase in the number of clients with hemodynamic instability was exacerbated in May and required a greater demand for work from the team. In the actions adopted in the logistics of the service, admission stands out, where care was based on the performance of various procedures, clinical stabilization and the establishment of communication to family members.

Health professionals working in critical and semi-critical care needed to prepare themselves to deal with the overload of critically ill patients, in a scenario of lack of equipment such as mechanical respirators, high-flow nasal catheters, non-invasive ventilation masks and personal protective equipment (PPE), which are extremely essential in view of the high transmissibility of the virus (Phua et al., 2020). This was and still is one of the challenges faced in the Brazilian context, which, like other global health systems, needed to undergo a rapid transformation to face and manage the health crisis (Rodriguez; Morales et al., 2020).

In the daily routine of the service, the team was faced with clinical worsening of the patients, prolonged hospitalization and difficulty in their recovery due to the systemic involvement caused by the disease. Another important point to highlight was the adoption of weekly meetings through videoconferencing in order to strengthen the initial training offered to professionals to improve care practices based on the discussion of cases and adverse events that occurred during the week. Thus, enabling an improvement in the coordination of care and communication between professionals.

The frontline position of the multidisciplinary team in the ICU environment makes it conducive to their protagonism due to the very characteristics of the profession that require them to remain at the patients' side for a longer time. Thus, the competencies of these professionals stand out in the application of Ministry of Health protocols related to the pandemic (Barbosa *et al.,* 2020).

However, it should be noted that the climate is one of total attention and apprehension. among health professionals, The need to face a totally unknown scenario in terms of speed of spread, possibility of infection on a scale never seen before and number of deaths only comparable to a war scenario. This scenario requires a lot of physical and emotional effort from health professionals who are and will be on the front line, in addition to stress and the high risk of contracting the virus.

Nursing professionals are one of the groups of vulnerability, since the number of deaths among health professionals is already a fact and causes concern for the authorities (Brasil, 2020)

The care and managerial challenges were especially related to factors such as the need to redefine workflows; need for rapid isolation; global clinical management; and infection prevention, considering both the protection of patients and health professionals. In addition, it was necessary to redefine public policies to increase the capacity of intensive care beds, focusing not only on infrastructure and supplies, but also on team management (Phua et al., 2020)

In the study conducted by Bitencourt *et al* .(2020), the protagonism of health professionals was pointed out in all interfaces of care for patients with COVID-19 from the composition of the commissions, through the planning and operation of the physical structure, human resources management and construction of protocols and care flows, in addition to acting directly in care.

In this context, it was noticed that the reconciliation of technical-scientific practice with humanization practices in these spaces has become a challenge due to the great demand required of health professionals. Despite this, and due to the isolation of these patients, actions such as video calls to family members were adopted, in addition to calls to family members made by medical professionals to pass on information in a more detailed way. The provision of activities that were part of the patients' daily lives were also included in the routine of the service, such as listening to music, praying, among others.

In this context, it is also worth mentioning the importance of social support as an element of protection that helps individuals to face stressful situations more efficiently. Therefore, the relevance of using other non-face-to-face devices to get in touch with others and strengthen social support through telephone calls and video calls is emphasized (WHO, 2020).

Among the limitations of the study are, due to the high demand required of multiple activities, the difficulty of recording all the actions performed and the impossibility of a more individualized focus on the difficulties and points of improvement identified in the actions of each group of professionals. As well as the lack of equipment, PPE and changes in protocols often made the team adapt the work process initially structured.

CONCLUSION

Promoting the implementation and management of the intensive care sector was a challenging process that required professionals to have excellence in technical and scientific knowledge and a strong emotional structure. In addition to care, managerial and clinical reasoning skills and acquisition of more knowledge in the area. Thus, it is extremely important that the professional maintains a posture of active listening, empathy, communication, multiprofessional work, critical sense and humanization to generate a good functioning of the service in which he is inserted.

This reality highlighted some important aspects in the context of the Brazilian health team, such as the inadequate number of professionals, low salaries and inadequate working conditions. It also strengthened the importance of a service guided by the technical-scientific basis, relevance of training and integration of the multiprofessional team, and strengthened the perception of the need to implement and manage an evidence-based service in order to empower management tools, technologies, and knowledge about the care of patients with COVID-19.

Among the limitations of the study are, due to the high demand required of multiple activities, the difficulty of recording all the actions performed and the impossibility of a more individualized focus on the difficulties and points of improvement identified in the actions of each group of professionals. As well as the lack of equipment, PPE and changes in protocols often made the team adapt the work process initially structured.

In-depth studies on the subject are relevant because they provide society with knowledge of the importance of the multiprofessional team's performance in the face of critically ill patients in all contexts. As well as strengthening the importance of training and continuing education in health services.

REFERENCES

1. Barbosa, D. J., et al. (2020). Fatores de estresse nos profissionais de enfermagem no combate à pandemia da COVID-19: síntese de evidências. *Com. Ciências Saúde, 31*(suppl 1), 31-47. [Link](http://www.escs.edu.br/revistaccs/index.php/comunicacaoemcienciasdasaude/article/view/651)

2. Berghetti, L., Franciscatto, L. H. G., & Getelina, C. O. (2017). Formação do Enfermeiro Acerca do Gerenciamento: Entraves e Perspectivas. *Rev enferm Centr-Oeste Min., 9*, e2820. [Link](http://dx.doi.org/10.19175/recom.v9i0.2820)

3. Bitencourt, J. V. O. V., et al. (2020). Protagonismo do enfermeiro na estruturação e gestão de uma unidade específica para COVID-19. *Texto & Contexto-Enfermagem, 29*.

4. Brasil. (2020). Ministério da Saúde Secretaria de Vigilância em Saúde. Boletim Epidemiológico Especial 21: Doença pelo Coronavírus COVID-19. Brasília: Ministério da Saúde / Secretaria de Vigilância em Saúde. [Link](http://saude.gov.br/images/pdf/2020/July/08/Boletimepidemiologico-COVID-21-corrigido-13h35.pdf)

5. Dal'Bosco, E. B., et al. (2020). Mental health of nursing in coping with COVID-19 at a regional university hospital. *Rev Bras Enferm, 73*(2), e20200434. [DOI](https://doi.org/10.1590/0034-7167-2020-0434)

6. Ferrari, F. (2020). COVID-19: Dados Atualizados e sua Relação Com o Sistema Cardiovascular. *Arq. Bras. Cardiol, 114*(5), 1678-4170.

7. Ferreira, J. M. (2017). Incidência de infecção primária da corrente sanguínea relacionada a cateter venoso central e os cuidados de enfermagem na unidade de terapia intensiva do Hospital Regional Dr. Homero de Miranda Gomes. Repositório Universitário da Ânima, Palhoça, p. 3-39. [Link](https://repositorio.animaeducacao.com.br/handle/ANIMA/4914)

8. Instituto de Saúde e Gestão Hospitalar. (2021). Unidade Hospitalar Hospital Regional Norte. [Link](https://www.isgh.org.br/onde-estamos/hospital-regional-norte)

9. Massuda, A., et al. (2020). Nota Técnica nº 6. Pontos-chave para gestão do SUS na resposta à pandemia de COVID-19. Instituto de Estudos para Políticas de Saúde, abr.

10. Meneses, A. S. (2020). Gerenciamento Emergencial de Recursos da Atenção Primária à Saúde no Enfrentamento à Pandemia da COVID-19. *SciELO Preprint, 1*(1), 1-13. [DOI](https://doi.org/10.1590/SciELOPreprints.557)

11. Pereira, A. S., et al. (2018). Metodologia da pesquisa científica. [Free e-book]. Santa Maria/RS. Ed. UAB/NTE/UFSM.

12. Phua, J., et al. (2020). Intensive care management of coronavirus disease 2019 (COVID-19): challenges and recommendations. *The Lancet Respiratory Medicine, 8*(5), 506-517. [DOI](https://doi.org/10.1016/S2213-2600(20)30161-2)

13. Rodriguez-Morales, A. J., et al. (2020). COVID-19 in Latin America: The implications of the first confirmed case in Brazil. *Travel Medicine and Infectious Disease, 35*, 1-3. [DOI](https://doi.org/10.1016/j.tmaid.2020.101613)

14. Souza, J. O., Machado, V. B., & Sousa, A. L. R. S. (2019). Competências gerenciais do enfermeiro: uma revisão integrativa. *Rev Ciências da Saúde e Educação IESGO, 1*(2), 1-20. [Link](http://revista.iesgo.edu.br/ojs/index.php/CSEI/article/view/27)

15. Soares, M. I., Resck, Z. M. R., & Terra, F. S. (2016). Saberes gerenciais do enfermeiro no contexto hospitalar. *Rev bras enferm, 69*(4), 676-683. [DOI](http://dx.doi.org/10.1590/0034-7167.2016690409i)

16. Treviso, P., et al. (2017). Competências do enfermeiro da gestão do cuidado. *Rev Adm Saúde, 7*(69), 14. [DOI](http://dx.doi.org/10.23973/ras.69.59)

17. OMS (Organização Mundial de Saúde). (2021). World Health Organization. Painel de Emergência de Saúde da OMS. [Link](https://covid19.who.int/region/amro/country/br)

18. WHO (World Health Organization). (2020). Q&A on coronaviruses (COVID-19). [Link](https://www.who.int/emergencies/diseases/novel-coronavirus-2019/question-and-answers-hub/q-a-detail/q-a-coronaviruses)

Nitric oxide as a vascular reactivity factor in dietary formulations consumed in menopause: Sanitary and nutritional surveillance of food: Case report

https://doi.org/10.56238/sevened2024.005-016

Claudia Elizabeht Guerrero[1]

ABSTRACT

Menopausal women, hypertension, dyslipidemia, sedentary lifestyle and stress as cardiovascular risk factors. Consult after consuming a dietary product containing L-arginine. With each consumption of the product, he reports intense vasodilation and palpitations, effects that subside when the intake is stopped and reappear with a new consumption. In Argentina, these products lack pharmacovigilance processes and are available for purchase without a prescription by the public. The compound L-arginine is a substrate for the production of nitric oxide, a vascular reactivity factor.

Keywords: Nitric Oxide (NO), Menopause, Suppl, Dietary, Pharmacovigilance (FVG).

[1] Pharmacology. Còrdoba, Argentina.
UNC- National University of Cordoba
UNVM - National University of Villa Maria
IUCBC-University Institute of Biomedical Sciences of Cordoba
E-mail: claueguerrero@hotmail.com
ORCID: 0000-0002-5460-1325

INTRODUCTION

CLINICAL CASE

Objective

Recognize that the presence of L-arginine in dietary products may be a factor of vascular reactivity when consumed as a supplement in the climacteric and/or menopause.

CLINICAL CASE

A 51-year-old patient, retired teacher. She has 2 teenage children who live with her and her husband. He has been diagnosed with hypertension for 1 year. Medicated with enalapril 10 mg/d in a single dose and atorvastatin 10 mg/d. You don't engage in physical activity.

She attended the Climacteric and Menopause Department for symptoms of hypoestrogenism, such as difficulty falling asleep and vaginal dryness. She stopped treatment with Tibolone (2.5 mg/d) so she sporadically feels hot flashes, but no longer as intense as at the beginning of her climacteric. She reports tiredness and feeling stressed.

She states that she does not want to perform hormone replacement therapy (HRT), so she self-medicates with dietary supplements. During his visit, he said that when he took them, he realized that he blushed in a way that drew the attention of everyone around him, he registered palpitations and low BP; He stopped taking it for a while and when he started consuming it again, the symptoms reappeared, so he got scared and decided to consult.

As a pathological family history, he comments that his father died of AMI at the age of 65 and his maternal family, mothers, aunts and grandmother are hypertensive.

Physical examination confirmed: BP: 154/98 mmHg. Weight 70 kg H 1.62 pcs: 105 cm

Estudios complementarios: Colesterol total 245 mg/dl, LDLc 160mg/dl; TG 160 mg/dl, HDLc 40 mg/dl y Glucemia 100mg/dl

Indications after the first consultation: scheduled physical activity, Mediterranean diet, daily BP control, and complete laboratory. Continue with your usual medication, incorporate therapy with local promestrien. Discontinue dietary product.

DISCUSSION

Menopause is characterized by the cessation of ovarian function and the permanent cessation of menstrual cycles. This period of life is determined by progressive hypoestrogenism and is clinically confirmed after 12 months of amenorrhea; It can start between the ages of 35 and 40 and extend until around age 65. Torres Jimenez, AP and Torres Rincón, JM, 2028). This event brings with it reduced estradiol production, as well as increased follicle-stimulating hormone (FSH) levels and decreased inhibin levels. (El Khoudary SR, Greendale G, et al, 2019).

In general, women in developed countries enter menopause later than those living in developing countries (Schoenaker, DA; Jackson, C et al. 2014).) (World Population Ageing; 2019). This later age in natural menopause has been associated with a reduced risk of cardiovascular disease (CVD). (Bolaños B, Ortega E; 2021)

Hypoestrogenism gives rise to the appearance of vasomotor symptoms, insomnia, vaginal dryness (urogenital syndrome), menstrual and mood disorders, among others, Gómez Alaya, AE. (2010) but the most significant in terms of its metabolic impact is the alteration of abdominal fat distribution, which leads to an increase in cardiovascular risk in these patients.

Hormone replacement therapy (HRT) is the first-line therapy for symptom relief and prevention of comorbidities (Trémollieres FA, Chabbert-Buffet N; 2022) Among the ways of providing estrogen, the transdermal route in standard doses is the most indicated due to the reduction of thromboembolic phenomena that can accompany the oral administration of the hormone. (Level of evidence: 1A) (Renoux C, et al; 2010; Yana Vinogradova. 2019). This fear of adverse reactions (ADRs) typical of hormone therapy (HRT) and concern about improving health make it easier for some women to seek alternative therapies with natural estrogens (Guerrón Enríquez, SX et al; 2021). There are several treatment options available, both pharmacological and non-pharmacological, to relieve menopausal symptoms, especially vasomotor symptoms and many women are inclined towards natural products. **(**Belardo MA et. As of 2018)

They are specially formulated products designed to supplement the incorporation of nutrients into the diet of healthy people, who have basic dietary needs that are not met or greater than usual. They contain some of the following nutrients: proteins, lipids, amino acids, carbohydrates, vitamins, minerals, dietary fiber, and herbs. Dietary supplements can come in the form of tablets, capsules, tablets, powders, drops, etc. They should not be confused with medicines because, unlike medicines, they are intended for healthy people and should not be consumed in the hope of mitigating, curing or treating any ailment. (ANMAT, Food Health and Nutritional Surveillance. 2024)

The WHO defines pharmacovigilance as the science and activities related to the detection, evaluation, knowledge and prevention of adverse reactions and other potential drug-related problems. (Pharmacovigilance -PAHO/WHO, 2020)

It is a primary tool for monitoring drugs in their post-marketing phase, in order to detect adverse reactions that escape those reported during clinical trials. Dietary products or supplements, contrary to what the regulation indicates, are not covered by this activity in Argentina, so they escape the analysis of adverse reactions and therefore we do not have statistics in this regard.

Phytoestrogens are non-steroidal compounds derived from plants that possess weak estrogenic action. The most studied group is that of isoflavones mainly derived from soybeans, genistein and daidzein, which have a structure similar to estradiol. These compounds have an affinity

for the ER receptor β. They are administered by PO and metabolized in the intestine. (Monteiro, NES et al; 2028).

L-arginine (L-Arg) is a semi-essential amino acid (Woyka J; 2017), it can be combined with other prescription or over-the-counter medications. It is also found in seafood products such as fish or seafood. Its properties include: improving athletic performance, increasing the protection of the immune system, dilating blood vessels and improving circulation, since L-arginine is transformed into nitric oxide. On the other hand, taking L-arginine for a period of one month can increase vascularization, but after six weeks the effects are not so positive. This is called a chronic negative effect after supplementation and, in the case of L-arginine, may be due to a decrease in enzymes involved in nitric oxide synthesis.

Dietary supplements can be easily purchased on the market, predisposing patients to be able to use them at their own discretion and without any control (Borrelli F; 2010). This situation raises the possibility that the intake of nutritional supplements may lead to the occurrence of unwanted effects in the individual. In the particular case that concerns us, the only medication that the patient had included was the dietary supplement with L-arginine and the symptoms were related to its intake. This fact was reinforced the moment he took the compound for the second time and the signs (ruddy, palpitations) appeared again.

It is an unusual situation, but the ingestion of nutritional products has caused several dozen hospitalizations and at least 5 deaths in Japan. These are pills that contained red yeast rice and were sold as a supplement capable of lowering cholesterol. Red yeast rice is a food used in traditional Chinese medicine and has an active component that is potentially effective in lowering cholesterol levels (monacolin K), but it may also contain a type of toxin that causes kidney failure. (IFOBAE (2024). A nutritional supplement is a product taken orally that contains a "dietary ingredient" to supplement the diet. In the present case, the supplement was used for therapeutic purposes, homologating estrogen therapy with natural products in order to mitigate vasomotor symptoms (hot flashes). It can include a wide variety of non-pharmaceutical products such as, but not limited to, vitamins, minerals, proteins, amino acids, traditional medicine preparations, herbal extracts, essential fatty acids, prebiotics, enzymes and metabolites (Burke L and Deakin V. 2006) In recent years, the increasing number of dietary supplements offered via the Internet and by e-mail has been of concern to health authorities because, In such circumstances, the quality of the products purchased cannot be guaranteed. The Decision No. 4980/2005of the ANMAT sets the ethical guidelines on product advertising. It should be clarified that, in order for a dietary supplement to be marketed in the country, it must have a registration (RNPA: National Registry of Food Products) granted by the corresponding health authority.

One of the main objectives of ANMAT is to promote food safety. To achieve this, it carries out actions that help prevent, detect and manage the risks transmitted by them. Food surveillance is used to detect problems with packaged foods, dietary supplements, food contact materials and packaging.

CONCLUSION

Health professionals must be vigilant and it is necessary to warn the community about the fact that many of these products are not properly registered, so they cannot be identified in a reliable and clear way with regard to their preparation, packaging and conservation. For this reason, and taking into account the risks involved in health, products of unknown origin that do not offer guarantees of safety and sanitary suitability should not be consumed.

The composition of L-arginine establishes the physiological basis for the production of Nitric Oxide (NO) and its impact on the endothelium, the vascular reactivity that characterized this case.

REFERENCES

1. Torres Jimenez, A.P., & Torres Rincón, J.M. (2028). Climaterio y Menopausia. Revista de la Facultad de Medicina (México), 61(2), 51-58. ISSN 2448-4865.

2. El Khoudary, S.R., Greendale, G., Crawford, S.L., et al. (2019). The menopause transition and women's health at midlife: a progress report from the Study of Women's Health Across the Nation (SWAN). Menopause, 26(10), 1213-1227. doi:10.1097/GME.0000000000001424

3. Schoenaker, D.A., Jackson, C.A., Rowlands, J.V., & Mishra, G.D. (2014). Socioeconomic position, lifestyle factors and age at natural menopause: a systematic review and meta-analyses of studies across six continents. International Journal of Epidemiology, 43, 1542–1562.

4. Departamento de Asuntos Económicos y Sociales de las Naciones Unidas, División de Población. (2019). World Population Ageing 2019: Highlights (ST/ESA/SER.A/430). Recuperado de https://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulation Ageing2019-Highlights.pdf

5. Bolaños, B., & Ortega, E. (2021). Riesgo cardiovascular asociado a menopausia. Revista Médica Sinergia, 6(1).

6. Gomez Alaya, A.E. (2010). Menopausia. Salud Genitourinaria Offarm, 29(5), 60-66.

7. Trémollieres, F.A., Chabbert-Buffet, N., Plu-Bureau, G., Rousset-Jablonski, C., Lecerf, J.M., Duclos, M., et al. (2022). Management of postmenopausal women: Collège National des Gynécologues et Obstétriciens Français (CNGOF) and Groupe d'Etude sur la Ménopause et le Vieillissement (GEMVi) Clinical Practice Guidelines. Maturitas, 163, 62-81.

8. Renoux, C., Dell'aniello, S., Garbe, E., & Suissa, S. (2010). Transdermal and oral hormone replacement therapy and the risk of stroke: a nested case-control study. BMJ, 340, c2519.

9. Vinogradova, Y. (2019). Uso de la terapia de reemplazo hormonal y riesgo de tromboembolismo venoso: estudios de casos y controles anidados utilizando las bases de datos QResearch y CPRD. BMJ, 364, k4810.

10. Guerrón Enríquez, S.X., Cano Hernández, L.K., & Sigcha Báez, J.C. (2021). Beneficios de los alimentos con fitoestrógenos en mujeres menopáusicas. Dilemas contemporáneos: educación, política y valores, 9(1), 00063. doi:10.46377/dilemas.v9i1.2900

11. Belardo, M.A., Starvaggi, A., Cavanna, M.M., & Pilnik, S. (2018). Estrategias no farmacológicas para el manejo de los síntomas vasomotores en la menopausia. Revista Peruana de Ginecología y Obstetricia, 64(1), 61-67.

12. ANMAT. (2024). Vigilancia sanitaria y nutricional de los alimentos.

13. Farmacovigilancia - OPS/OMS. (2020). Recuperado de http://www.pho.org

14. Monteiro, N.E.S., Queirós, L.D., Lopes, D.B., Pedro, A.O., & Macedo, G.A. (2018). Impact of microbiota on the use and effects of isoflavones in the relief of climacteric symptoms in menopausal women – A review. Journal of Functional Foods, 41, 100-111.

15. Woyka, J. (2017). Consensus statement for non-hormonal-based treatments for menopausal symptoms. Post Reproductive Health, 23(2), 71–75. doi: 10.1177/2053369117711646

16. Borrelli, F., & Ernst, E. (2010). Alternative and complementary therapies for the menopause. Maturitas, 66, 333–343. doi: 10.1016/j.maturitas.2010.05.010

17. IFOBAE. (2024). Investigan las muertes vinculadas a un suplemento.

18. Burke, L., & Deakin, V. (2006). Clinical Sports Nutrition (6th ed.). Sydney: McGraw-Hill. pp. 485-580.

19. Disposición Nº 4980/2005 de la ANMAT. Pautas éticas sobre la publicidad de productos.

Evaluation of the epidemiological profile of cardiovascular diseases in quilombolas in the municipality of Itapecuru-Mirim – MA

https://doi.org/10.56238/sevened2024.005-017

Ana Paula Costa Linhares[1], Davi Veloso Lima de Paula Sousa[2], Isabela Maria Mesquita Moreira[3], Calin dos Santos Kishishit Castro[4], Lorena Menegussi Machado[5], Marcelly Kelmanny da Luz Sampaio[6], Marcilene de Amorim Sandes[7], Maria Clara Pereira Nogueira da Cruz[8], Maria Fernanda Almeida do Vale[9], Raphaela Abreu Everton[10] and Mylena Andréa Oliveira Torres[11]

ABSTRACT

Cardiovascular diseases (CVDs) are conceptualized as a modification in the functioning of the cardiac system. Such diseases have been responsible for a relevant rate of morbidity and mortality, becoming a public health problem because they affect a significant population. Thus, it is worth mentioning that the black population is within the risk group for the development of CVDs, mainly due to their difficulty in accessing health services. Therefore, the objective of this study was to evaluate the prevalence of cardiovascular risk factors in quilombola communities in the municipality of Itapecuru-Mirim, in the state of Maanhão. Data collection was carried out through the application of a questionnaire, covering 110 individuals. The data were tabulated and analyzed in an Excel spreadsheet, and the qualitative variables were presented by means of absolute and relative frequencies and analyzed using the BioStata software. The results showed a predominance of females 57.27% (n=63), with a mean age of 49.39% for both sexes. Within the family history, the CVD that most commonly occurs is Arterial Hypertension 30.91% (n=34). In addition, 12.73% (n=13) reported being diabetic and 25.45% (n=27) hypertensive. Regarding blood pressure levels, the mean blood pressure in males was more altered (140x92 mmHg in systolic and 92.46 mmHg in diastolic), while blood glucose was 134.22 mg/dL among the participants. Thus, it is observed that the members of the two quilombola communities present risk behaviors that can culminate in the increase in the development of CVDs.

Keywords: Quilombolas, Cardiovascular Diseases, Risk Factors.

[1] Medical Student at Ceuma University, São Luís-MA
[2] Medical Student at Ceuma University, São Luís-MA
[3] Medical Student at Ceuma University, São Luís-MA
[4] Medical Student at Ceuma University, São Luís-MA
[5] Medical Student at Ceuma University, São Luís-MA
[6] Medical Student at Ceuma University, São Luís-MA
[7] Medical Student at Ceuma University, São Luís-MA
[8] Medical Student at Ceuma University, São Luís-MA
[9] Medical Student at Ceuma University, São Luís-MA
[10] Medical Student at Ceuma University, São Luís-MA
[11] Dr. in Biotechnology, Professor of Medicine, Ceuma University, São Luís-MA

INTRODUCTION

Cardiovascular disease (CVD) ranks first as a cause of death in the world, a condition that is on par with the general reality in Brazil. However, it is important to note that despite the high mortality, CVD is a preventable clinical condition (BENSENOR et al., 2019). In view of this, the relationship of risk factors for the development of CVD in the general population undergoes constant changes, which justifies the periodicity in the reassessment of these variables to outline effective prevention strategies (ROSA et al., 2021).

Thus, risk factors for cardiovascular disease are categorized into non-modifiable (age, ethnicity, and family history of cardiovascular disease) and modifiable – Diabetes Mellitus (DM), systemic arterial hypertension, dyslipidemia, and smoking (MALTA et al., 2021). In addition to the underlined, the absence of physical exercise and an unbalanced diet are well-established risk factors to predispose to chronic diseases and, in this context, are part of the chain of causal events of cardiovascular diseases (BENSENOR et al., 2019).

In Brazil, quilombola populations are conceptualized as a set of minority ethnic groups belonging to the black and Afro-descendant population, who reside in rural, semi-urban, quilombola regions and, more rarely, in urban areas. The quilombola population living in these communities share in their daily health conditions, knowledge, attitudes, beliefs, cultures, and health practices inherited from their ancestors (ROSA et al., 2021).

The characteristics already mentioned place them in a condition of evidence in the context of health research, given that they live in conditions of social vulnerability, far from health service networks, which hinders access to health diagnosis, therapy and rehabilitation services. Obstacles that corroborate the accentuation of chronic diseases, such as diabetes and systemic arterial hypertension (DO NASCIMENTO SILVA et al., 2020).

However, the risk factors associated with the development of CVD in individuals of African descent, especially those living in quilombola communities, are still poorly studied. Thus, considering the change in the lifestyle of the quilombola population, with the presence of sedentary lifestyle, obesity, alcoholism and smoking, and consequently the development of cardiovascular diseases, it is essential to carry out this study that aimed to evaluate the epidemiological profile of cardiovascular diseases in this population.

MATERIAL AND METHOD

This is a cross-sectional study, carried out in two quilombola communities in the state of Maranhão, Brazil, between October and November 2022. The sampling design was carried out through simple random selection, in which of the forty-four quilombola areas of MA (Brasil, 2019), two were selected. A simple random sampling study was carried out with 110 quilombolas from

Moreira and Santa Rosa do Barão villages, in the municipality of Itapecuru-Mirim, MA. The inclusion criteria adopted for the selection of quilombolas were: age ≥ 18 years, both genders and who agreed to participate in the research by reading, clarifying and signing the Free and Informed Consent Form (ICF). The exclusion criteria were: age under 18 years and individuals who did not sign the informed consent form. The collected data were tabulated and analyzed in an Excel spreadsheet using the statistical program BioStata. Quantitative variables were presented as absolute and relative frequencies. The research followed the following steps: 1st stage: the application of a questionnaire with the selected participants, with the collection of information on: age, sex, marital status, smoking, physical activity, eating habits. The average participant took about 4 minutes to complete this questionnaire. 2nd step: check the capillary glycemic index. Capillary blood glucose levels established by the Brazilian Society of Diabetes (2019-2020) were used as a reference. This guideline establishes the following classification: blood glucose ≤ 100 mg/dL: without DM; blood glucose > 100 and ≤ 126 mg/dL: prediabetes or high risk for developing DM and blood glucose ≥ 126mg/dL diagnosis of DM. 3rd stage: data from the Brazilian Society of Hypertension (2020) was used as a reference, the This protocol considers systolic blood pressure < 120 mmHg and diastolic blood pressure < 80 mmHg as optimal; systolic blood pressure between 120-129 mmHg or diastolic blood pressure between 80-84 mmHg is considered normal; systolic pressure between 130-139 mmHg or diastolic pressure between 85-89 mmHg as prehypertensive; systolic pressure between 140-159 mmHg or diastolic pressure between 90-99 mmHg as stage 1 hypertension; systolic pressure between 160-179 mmHg or diastolic pressure 100-109 mmHg as stage 2 hypertension and ≥ 180 mmHg for systolic or ≥ 110 mmHg. 4th stage: the weight and height of the quilombolas will be measured for anthropometric evaluation. The body mass index (BMI) is then calculated and will be analyzed by the NCHS table adapted by the CDC 2000, and incorporated by the department of primary care (2006), by the BMI/Age parameter, they are then classified by underweight (< 18.5 Kg/m2), normal (between 18.5-24.9 Kg/m2), overweight (25-29.9 Kg/m2) and obesity class I (30-34.9 Kg/m2), grade II obesity (35-39.9 kg/m2) and grade III obesity (> 40 kg/m2**).** To measure weight, a CADENCE digital scale will be used, with a capacity of up to 150 kg, and a stadiometer will be used to measure height. In addition, an inelastic tape measure with a length of 150 cm will be used to measure abdominal circumference (WC). To evaluate the abdominal circumference values, we will adopt points proposed by the Brazilian Obesity Guidelines (2016), since WC values ≥ 80 cm for women and ≥ 90 cm for men present increased cardiovascular risk.

RESULTS

According to the sociodemographic profile of the interviewees, the mean age was 49.3, with a mean of 51.0 for females and 47.0 for males. It was also found that the majority of quilombos were

female 57.27% (n=63), with incomplete primary education 22.73% (n=25) and single 34.55% (n=38), as shown in table 1.

110

Average Age		
Female	51,0952381	
Male	47,0652174	
Total	**49,3944954**	
Gender	**%**	**N**
Female	57,27%	63
Male	42,73%	47
Total	**100,00%**	**110**
Schooling	**%**	**N**
Incomplete elementary education	22,73%	25
Complete primary education	16,36%	18
Incomplete early childhood education	15,45%	17
Not educated	13,64%	15
No information	8,18%	9
Complete high school	8,18%	9
Complete higher education	7,27%	8
Incomplete high school	4,55%	5
Complete early childhood education	3,64%	4
Total	**100,00%**	**110**
Marital status	**%**	**Average Age**
Single	Female	51,0952381
Male	47,0652174	Total
49.3944954	23,64%	26
Widower	Sex	%
N	Female	57,27%
63	**Male**	**42,73%**

Source: authors (2024)

Table 2 shows that 60.91% (n=67) had a family history of cardiovascular disease in the family, 30.91% (n=34) had hypertension and 32.72% (n=36) had the disease.

1

47	**Total**	**100,00%**
110	60,91%	67
Não	Schooling	%
N	**Incomplete elementary school**	**22,73%**
18	**Incomplete kindergarten**	**15,45%**
17	Unschooled	13,64%
15	No information	8,18%
9	Completed high school	8,18%
9	Completed higher education	7,27%
8	Incomplete high school	4,55%
5	Complete kindergarten education	3,64%
4	Total	100,00%
110	1,82%	2
N	**Single**	**34,55%**
38	Consensual Union	23,64%
26	Married	23,64%
26	Widower	13,64%
15	Separated/Divorced	4,55%
5	Total	100,00%
110	0,91%	1
Netos	0,91%	1

Source: authors (2024)

Regarding lifestyle habits, table 3, it was observed that 65.45% (n=72) were not smokers, 46.36% (n=51) had never drunk and 53.64% (n=59) practiced some type of physical activity.

110

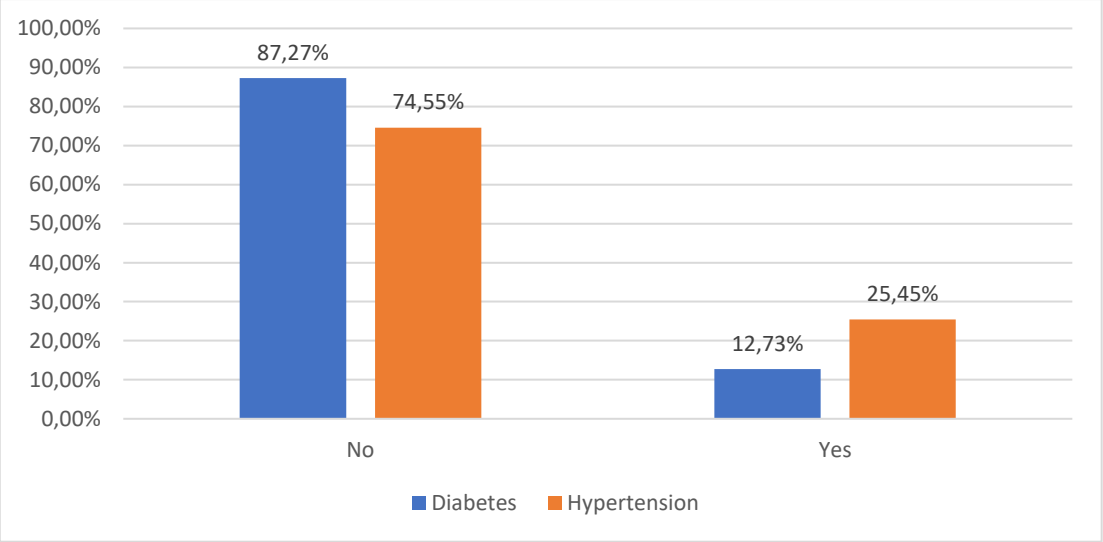
Smoking	**History of Cardiovascular Disease in the Family**	**%**
N	Yes	60,91%
67	No	39,09%
43	Total	100,00%
110	**100,00%**	**110**
N	**Hypertension**	**30,91%**
34	Acute myocardial infarction	7,27%
8	Cardiomegalia	5,45%
6	Valvular disease	4,55%
5	**Cardiovascular disease, unspecified**	**4,55%**

4	**Unknown**	**2,73%**
3	Aterosclerose	1,82%
2	45,45%	50
No information	If so, who	%
N	**Parents**	**32,73%**

Source: authors (2024)

Graph 1 shows that most of the interviewees did not have diabetes or hypertension, however, a minority (12.73% diabetes and 25.45% hypertension) self-reported having such diseases.

Graph 1 - Characterization of quilombola interviewees, according to self-reported diabetes and hypertension.



Source: authors (2024).

Regarding the anthropometric aspect, the mean BMI of females was 27.08 kg/ m2 and males 26.80 kg/^{m2}, demonstrating the presence of overweight. Regarding abdominal circumference (WC), the mean was 92.11 cm for men and 92 cm for women. Regarding the mean blood glucose, 138.52 mg/dL was observed for males and 131.07 mg/dL for females, demonstrating altered fasting glucose.

88,38181818

36	
10,00%	11
Grandparents	8,18%
9	**Guys**
Offspring	
4	Nephews
0,91%	1
Net	**0,91%**
Average Blood Glucose	
Male	138,5217391
Smoking	%

N	Never smoked
Former smoker	
21	Smoker
15,45%	17
Total	**100,00%**
Mean Diastolic BP (mmHg)	
History of alcoholism	%
N	Never drank
46,36%	**51**

Source: authors (2024)

Table 5 shows a high consumption of fried foods on a weekly basis, however, the interviewees also consume fruits and vegetables.

Source: authors (2024).

Alcoholist
30,00%
Former Alcoholicist
23,64%
Total
100,00%
110

Table 6 shows that 53.64% (n=59) consumed canned goods, 66.36% soft drinks (n=73), 55.45% (n=61) sweets, and 96.36% (n=106) did not add salt to ready meals.

110

Consumption of canned goods	%	n
In the last 3 months, practice of physical activity	%	N
Yes	53,64%	59
No	**45,45%**	**50**
Total	**100,00%**	**110**
Yes	66,36%	73
No	33,64%	37
Total	**100,00%**	**110**
Sweets consumption	**Female**	**27,08398666**
Male	26,80493157	Total
26,96331419	44,55%	49
Mean Waist Circumference (cm)	**100,00%**	**Male**
Total	**92,04**	**N**
No	Average Blood Glucose	106
Male	138,5217391	Female

131,0793651	**Total**	**134,2201835**

Source: authors (2024)

DISCUSSION

Most of the interviewees were female, with a mean age of 49.3 years and single. According to the research by Santos *et al.,* (2020) in the quilombolas of Bahia, it was found that the age range between 18 and 92 years had an average of 49 years and 61.2% of those surveyed were women. These data were concomitant with the research carried out in Povoado Moreira and Santa Rosa do Barão, a fact that reinforces the thesis that women participate more in the research carried out.

Among the factors analyzed in the socioeconomic profile, it was observed in the study that the majority had a low level of education, an alarming factor, because individuals who had never studied or who had studied only the initial grades had a higher prevalence of heart and ischemic diseases when compared to those who had completed basic education. Low schooling contributes to the individual's lack of knowledge about conditions that are sensitive to the promotion, prevention, and control of cardiovascular diseases (BEZERRA *et al.,* 2017).

Regarding smoking and alcoholism, it was evidenced that the majority did not practice these behavioral habits. However, 15.45% (n=17) smoked and 30% (n=33) consumed alcoholic beverages. Factors that are admittedly increased converters to cardiovascular risks. In the research by Santos *et al*., (2019) in the state of Sergipe, it was observed that among the behavioral variables reported by the participants, the following percentages stood out: being a smoker, 37.18%; having habits of drinking alcoholic beverages, 60.77%, data that are far from those found in the quilombola community of the Moreira and Santa Rosa do Barão villages in Maranhão.

Regarding the performance of physical activity, it was found in the research in question that the majority 53.64% (n= 59) practice some sport, especially soccer and cycling. In addition to the practice of planting and harvesting, however, there was a high percentage of sedentary individuals 45.45% (n=50), this percentage of physical inactivity probably reflects the idleness in quilombola environments in part of the months, as it is not the time of harvest or planting. However, in the research by Mussi *et al.* (2015) carried out in the Tomé Nunes Community, it was identified that most of the respondents did not practice any type of physical activity (67.8% women and 58.4% men). In this context, another study showed that sociodemographic and social behaviors influence the sedentary behaviors of quilombolas, such as being exposed to screens for two or more hours a day during the week (ALMEIDA *et al*., 2018).

Regarding the anthropometric profile, it was found that most of them are overweight, concomitantly, a study conducted by Bezerra *et al.* (2017) in the Quilombola Communities of Vitória da Conquista, found that in the BMI categories, there was a prevalence for overweight individuals (PR = 1.39; 95%CI: 1.16-1.66) and obesity (PR = 1.87; 95%CI: 1.37-2.52), in relation to low

weight/normal weight. In the studies conducted by Fontelle *et al.* (2022) observed a higher prevalence of obesity and overweight among women (29.5% and 62.6%, respectively).

AH and DM characterize increased morbidity and mortality conditions among the quilombola people. In this context, the prevalence of AH 25.45% (n=28) and DM with 12.73% (n=14) self-reported by quilombolas in the study in question was high, when compared to the percentage estimates of the general population of the same state (MA) – 19.33% (AH) and 8.96% (DM), according to data from the Ministry of Health (Vigitel, 2021). This fact is also evidenced in the research by Santos *et al.* (2019) with quilombola adults from Sergipe (SE), in which it was found that the prevalence of 26% of SAH in the quilombola communities of Sergipe was high, when compared to the estimates of the general population of 20.4% in the same state, with similar age groups. The authors state that hypertension is more prevalent in black populations when compared to whites, however, the etiology of the disease and environmental factors influence the development of hypertension, depending on race.

The study found that most of the interviewees had a family history of hypertension, especially first-degree kinship (father, mother and siblings). Cordovil and Almeida (2018) in their research with quilombola women from the village of Nazaré do Bruno, in the rural area of Caxias, the results showed that 77% of the interviewees had relatives with cardiovascular diseases in their family history. The authors point out that there is a strong influence on development with family history, especially first-degree history.

Regarding BC, the study in question showed that most women were at high risk for developing CVD. Cordovil and Almeida (2018) observed that the majority of Marajoara quilombola adults had a risk of 41.4% in males and 70.4% in females, according to the CM. Adipose tissue synthesizes and secretes multiple mediators and cytokines, which participate in mechanisms that induce dyslipidemia, insulin resistance, hypertension, and atherosclerosis (PAULI *et al*., 2019).

In this study, a high intake of canned goods, sweets, soft drinks and fried foods was observed, demonstrating that access to marketed food and the abandonment of agriculture seem to be one of the most frequent factors in the nutritional transition among quilombolas. However, in the research by Corrêa e Silva (2021) in the quilombola communities of Santo Antônio (Concórdia do Pará, northeast of Pará) and São João (Salvaterra, Marajó island), it was observed that 20% of the interviewees consumed industrialized and easy-to-prepare products, drawing attention to the low frequency of these foods among this population.

CONCLUSION

Based on this survey, it should be stated that there are well-established comorbidities and community hygienic-dietetic habits, which contribute to the anticipation of the onset or worsening of

cardiovascular diseases. Systemic arterial hypertension, diabetes, family history of cardiovascular diseases, physical inactivity, smoking and alcoholism are factors that favor the onset of multivascular diseases, especially for the risk of developing cardiovascular diseases. The prevalence of arterial hypertension and smoking among the quilombolas of Povoado Moreira and Santa Rosa do Barão de Itapecuru-mirim (MA) were shown to be the main predictors for the development of cardiovascular diseases. These findings point to the need for better reach, planning and optimization of health care to communities by care networks and call for a better balance of the institutional support of the macro and micro health regions of Maranhão to this segment, which is the object of our study.

REFERENCES

1. ALMEIDA, Claudio bispo. et al. (2018). Determinantes sociodemográficos do comportamento sedentário em adultos quilombolas. *Cuba Salud 2018*.

2. BENSENOR, Isabela Martins. (2019). Prevalência de fatores de risco cardiovascular no mundo e no Brasil. *Revista da Sociedade de Cardiologia, Estado de Säo Paulo*, p. 18-24.

3. BEZERRA, V. M. et al. (2017). Pré-hipertensão arterial em comunidades quilombolas do sudoeste da Bahia, Brasil. *Cadernos de Saúde Pública, 33*.

4. BRASIL, Ministério da Saúde. (2019). Quilombolas no Brasil. [Link](https://educa.ibge.gov.br/jovens/materias-especiais/21311-quilombolas-no-brasil.html). Acesso em 28 de fev. 2024.

5. BRASIL, Ministério da Saúde. (2021). Sistema de vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico. [Link](http://plataforma.saude.gov.br/vigitel/). Acesso em 28 de fev. 2024.

6. CORDOVIL, Yuri Freitas; ALMEIDA, Silvia dos Santos. (2018). Variáveis antropométricas e fatores de risco cardiovascular associados em Quilombolas Marajoaras. *RBONE-Revista Brasileira de Obesidade, Nutrição e Emagrecimento, 12*(71), p. 406-415.

7. CORRÊA, Nádia Alinne; SILVA, Hilton P. (2021). Da Amazônia ao guia: os dilemas entre a alimentação quilombola e as recomendações do guia alimentar para a população brasileira. *Saúde e Sociedade, 30*.

8. Departamento de Atenção Básica. (2006). *Obesidade / Ministério da Saúde, Secretaria de Atenção à Saúde, Departamento de Atenção Básica*. [Link](https://bvsms.saude.gov.br/bvs/publicacoes/estrategias_cuidado_doenca_cronica_obesidade_cab38.pdf). Acesso em fev. 2024.

9. Diretrizes Brasileira de Obesidade. (2016). Associação brasileira para o estudo da obesidade e da síndrome metabólica. *Diretrizes brasileiras de obesidade*. 4. ed. São Paulo: ABESO.

10. DO NASCIMENTO SILVA, Paula Gabriella et al. (2020). Fatores de risco cardiovascular em idosos de uma comunidade quilombola. *Revista Enfermagem UERJ, 28*, p. 44773.

11. MALTA, D. C. et al. (2021). Estimativas do risco cardiovascular em dez anos na população brasileira: Um estudo de base populacional. *Arquivos Brasileiros de Cardiologia, 116*, p. 423-431.

12. MUSSI, R. F. et al. (2015). Atividades físicas praticadas no tempo livre em comunidade quilombola do alto sertão baiano. *LICERE-Revista do Programa de Pós-graduação Interdisciplinar em Estudos do Lazer, 18*(1), p. 157-187.

13. PAULI, Sílvia et al. (2019). Prevalência autorreferida de hipertensão e fatores associados em comunidades quilombolas do Rio Grande do Sul, Brasil. *Ciência & Saúde Coletiva, 24*, p. 3293-3303.

14. ROSA, Randson Souza et al. (2021). Risco cardiovascular e fatores associados à saúde em pessoas afrodescendentes hipertensas residentes em comunidade Quilombola. *Revista Cuidarte, 12*(2).

15. SANTOS, A. G. et al. (2020). Fatores associados à obesidade em adultos quilombolas baianos. *RBONE-Revista Brasileira de Obesidade, Nutrição e Emagrecimento, 14*(85), p. 230-240.

16. SANTOS, D. M. S. et al. (2019). Prevalência da hipertensão arterial sistêmica em comunidades quilombolas do estado de Sergipe, Brasil. *Arquivos Brasileiros de Cardiologia, 113*, p. 383-390.

17. Sociedade Brasileira de Cardiologia. (2020). Sociedade Brasileira de Hipertensão. Sociedade Brasileira de Nefrologia. *IV Diretrizes Brasileiras de Hipertensão*. *Arq Bras Cardiol 2020; 95*(Supl. 1):1-51.

18. Sociedade Brasileira de Diabetes. (2019). *Diretrizes da Sociedade Brasileira de Diabetes 2019-2020*. [Link](https://portaldeboaspraticas.iff.fiocruz.br/wp-content/uploads/2021/08/Diretrizes-Sociedade-Brasileira-de-Diabetes-2019-20201.pdf). Acesso em fev. de 2024.

Treatment for hypoplastic left heart syndrome: A literature review

https://doi.org/10.56238/sevened2024.005-018

Augusto Hipólito Chagas Freato[1], Pedro Guilherme Coutinho Ribeiro[2], Calin dos Santos Kishishit Castro[3], Filipe Bochensky Siqueira[4], Josimar Cunha Rodrigues Junior[5], Beatriz Furtado Ferro[6], Camila Coelho Chaves Gaspar[7] and José Kleber de Figueiredo[8]

ABSTRACT

Introduction: Hypoplasia of the left ventricle is identified as extremely reduced dimensions of the cardiac structures of the left side, including the left atrium, mitral valve, left ventricle, aortic annulus and ascending aorta. It is a fatal and difficult to treat disease and its surgical correction is not yet possible, however, palliative surgical interventions are currently proposed that should be performed in the first days of life. Objective: To analyze treatments for hypoplastic left heart syndrome. Method: This is an integrative review, in the sense that this study adopted the criteria of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). A search was conducted in the following databases: Medical Literature Analysis and Retrieval System Online (Medline/Pubmed) and Latin American and Caribbean Health Sciences Literature (LILACS). Result and Discussion: Based on the aspect of eligibility for the review, 8 articles were selected. According to them, hypoplasia of the left heart continues to be the main serious congenital cardiac anomaly, even with the reduction in mortality. Regarding postnatal treatment, there has been an evolution in the immediate management at birth in the preservation of the clinical condition, with the use of prostaglandin E1 and vasoactive drugs. In this context, the initial Norwood-Sano technique started to have a lower risk, and consequently a higher survival rate in this phase. Conclusion: It is verified that surgical procedures are still considered gold standards for the care of this patient, however, prenatal cardiac interventions are promising treatment options and, as well as stem cell therapy, provide important clues for the application of new approaches.

Keywords: Treatment, Congenital heart disease, Hypoplastic left heart syndrome.

[1] Medical Student at Ceuma University, São Luís-MA
[2] Medical Student at Ceuma University, São Luís-MA
[3] Medical Student at Ceuma University, São Luís-MA
[4] Medical Student at Ceuma University, São Luís-MA
[5] Medical Student at Ceuma University, São Luís-MA
[6] Medical Student at Ceuma University, São Luís-MA
[7] Medical Student at Ceuma University, São Luís-MA
[8] Full Physician of the Brazilian Society of Cardiology

INTRODUCTION

Left ventricular hypoplasia is identified as extremely reduced dimensions of left-sided cardiac structures, including the left atrium, mitral valve, left ventricle, aortic annulus, and ascending aorta. The diagnosis of left ventricular hypoplasia syndrome can be made during pregnancy by means of fetal echocardiography (during prenatal care) or soon after birth, with echocardiography (when suspicion arises during the pediatric physical examination) that should be performed during the maternity ward. A chest X-ray and an electrocardiogram (ECG) are performed for a differential diagnosis, and cardiac catheterization is required (ATIK, 2021).

The uncommon congenital heart anomaly, left ventricular hypoplasia, has an incidence of 266 per 1 million live births. In addition, the annual incidence of hypoplastic left heart syndrome in North America is approximately 2,000 cases (SHENOY, 2014). Between January 1990 and December 2008, during the Fetal Cardiology Consultation, 311 congenital heart diseases were diagnosed, and 67 of these cases (21.5%) corresponded to Hypoplastic Left Heart Syndrome (DIONÍSIO, 2011).

As for the clinical manifestations of left ventricular hypoplasia syndrome, these arise with the closure of the ductus arteriosus during the first 2 days of life. Soon after, signs of heart failure and shock quickly appear, including tachypnea, dyspnea, weak pulse, pale or bluish skin, hypothermia, lethargy, and a reduction in the number of wet diapers (DIONÍSIO, 2011).

When there is a decrease in the blood flow received by the body, the vital organs cease to receive sufficient blood flow. If there is no return of adequate blood flow, the baby dies (ATIK, 2021).

Left Ventricular Hypoplasia Syndrome is, therefore, a fatal disease that is difficult to treat (NERY, 2021). Surgical correction is not yet possible, however, palliative surgical interventions are currently proposed that should be performed in the first days of life, so the treatment of this syndrome can be done through neonatal heart transplantation or staged palliative surgery described by Norwood (FANTINI *et al.*, 2004).

However, preoperative prophylactic clinical treatment should be established soon after birth in those patients who do not require urgent surgery through the use of prostaglandins (0.05 to 0.1 mcg/kg/min) in order to preserve the systemic flow through the ductus arteriosus until the surgical approach, in addition to vasodilators such as dobutamine and adrenaline. they play an important role as they are able to maintain lung pressure and cardiac output at adequate levels (ATIK, 2021).

The surgical procedure is performed in a few steps. During the first week of life, the first step is made with the Norwood procedure (SIFFEL et al., 2015), which aims to place the right ventricle in a systemic position by sectioning the pulmonary trunk and connecting the ascending aorta with the ventricle (NERY, 2021).

The second stage is performed at 3 to 6 months of age through the bidirectional Gleen or hemi-Fortan procedure, the superior vena cava is connected to the right pulmonary artery so that part of the systemic venous return bypasses from the right atrium to the lungs, aiming at oxygenation in the third stage is performed between 18 and 36 months of age and consists of a modified Fontan procedure, in which the flow from the superior vena cava to the superior vena cava and pulmonary artery is modified. (SIFFEL et al., 2015). The aim of this study was to analyze treatments for hypoplastic left heart syndrome .

METHOD

This is an integrative review, in the sense that this study adopted the criteria of the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA). A search was conducted in the following databases: Medical Literature Analysis and Retrieval System Online (Medline/Pubmed) and Latin American and Caribbean Health Sciences Literature (LILACS). Data was collected from April and May 2023. The descriptors for the search were defined after consultation in the DeCS (Descriptors in Health Sciences), namely: treatment, congenital heart *defects, congenital heart defects* and *hypoplastic left heart syndrome*

The descriptors were associated with each other according to the language and other combinations by the Boolean operator "AND". Articles in Portuguese/English languages published in the last 10 years were considered for eligibility evaluation. To delimit the eligibility of the studies, the titles and abstracts of all research results were selected in two stages by a reviewer (study authors), using the defined inclusion and exclusion criteria, namely: inclusion criteria: scientific articles with full text available free of charge, case reports, quantitative, qualitative, cross-sectional, randomized, Portuguese language and English studies; and exclusion criteria: duplicates, revisions, protocols, letters, editorials, monographs and theses. The search strategy is detailed in Chart 1.

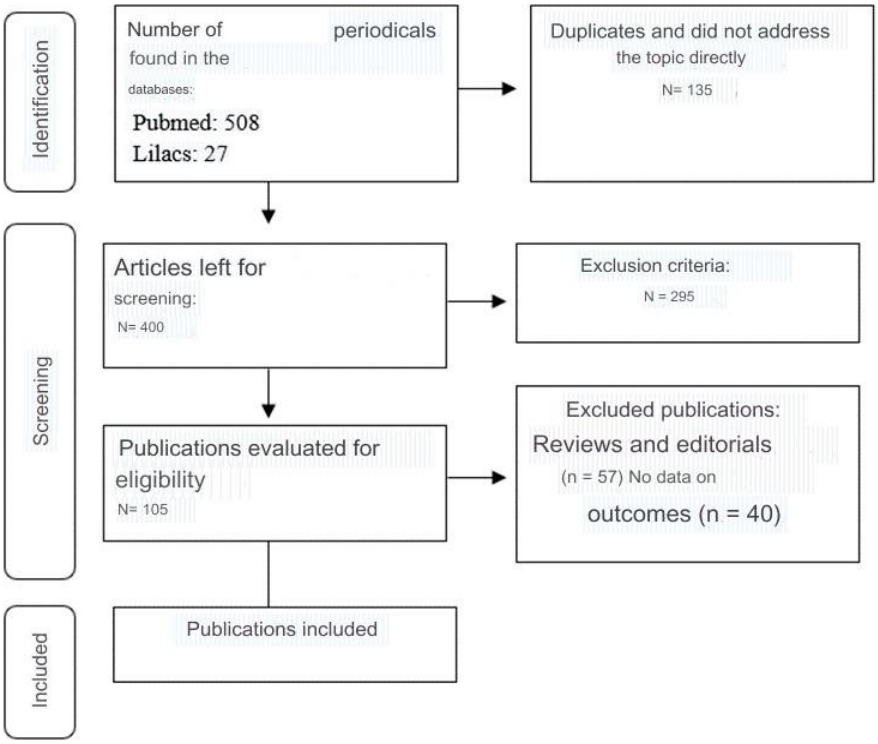
Medline/Pubmed			
Searchs	**Filters**	**Keywords**	**Results**
1	Free Full Text/ 10 years	*treatment AND heart defects, congenital AND hypoplastic left heart syndrome*	436
2	Free Full Text/ 10 years	*treatment AND hypoplastic left heart syndrome*	33
3	Free Full Text/ 10 years	*hypoplastic left heart syndrome*	39
Lilacs			
1	Free Full Text/ 10 years	tratamento AND cardiopatias congênitas AND síndrome de hipoplasia do coração esquerdo	5
2	Free Full Text/ 10 years	tratamento AND síndrome de hipoplasia do coração esquerdo	9
3	Free Full Text/ 10 years	síndrome de hipoplasia do coração esquerdo	13

After the searches, the articles were selected for the result, in which the titles and abstracts were read and reviewed to verify whether they should be included or excluded. Next, the full text of the journals identified in the previous phase was reviewed to determine their eligibility for data extraction.

RESULTS AND DISCUSSION

The flowchart (Figure 1) shows the process of managing the selection of publications in this review.

Figure 1 – Article eligibility flowchart.



Source: Authors, (2023)

Based on the aspect of eligibility for the review, a total of 8 articles were selected for analysis. In order to present the analyzed articles in a more didactic way and to facilitate a comparative analysis, it was decided to arrange their characteristics in the form of a chart 1.

The probability of survival was 66% during the first week, 27% during the first year of life, and 24% during the first 10 years. For children with information on surgical intervention (

Author (Year)	**Method**	**Sample**	**Treatment**	**Main result**
Atik (2021)	Case report	21-year-old patient has been followed since birth with a diagnosis of left heart hypoplasia	Norwood operation at 4 days of age, bidirectional Glenn technique at 5 months and total cavopulmonary with non-fenestrated external tube at 5 years of age.	The patient showed good long-term evolution.
Bezerra et al. (2022)	Retrospective cohort	80 patients with HLHS	Norwood Operation	The 30-day survival rate was 91.3% and the intermediate survival rate was 81.3%.
Burkhart et al. (2019)	Prospective, non-randomized clinical trial	10 patients	Direct intramyocardial injection of autologous mononuclear cells derived from umbilical cord blood	All patients successfully underwent stage II palliation and intramyocardial injection of cord blood-derived mononuclear cells. Operative mortality was 0%. There was a single adverse event related to cell release: an epicardial bleed at the injection site that required simple superseeding. The cohort demonstrated no significant safety concerns through 6 months. Furthermore, the treatment group did not demonstrate any reduction in cardiac function in the study setting related to intramyocardial injections of autologous cells.
Kovacevic et al. (2018)	Retrospective multicenter study	67 fetuses	Medline/Pubmed	Searches
Filters	Descriptors	Results	1	Free Full Text/ 10 years
treatment AND	436	two	Free Full Text/ 10 years	treatment AND
33	3	Free Full Text/ 10 years	hypoplastic left heart syndrome	39 The daily goal was to administer ≥ 8 h of oxygen at 8 – 9 L/min of 100% FiO2 until delivery. Maternal arterial partial oxygen pressure (PaO2) was measured after 1 h of 8 L/min O2. If PaO2 was less than 250 mmHg O2, the flow was increased to 9 L/min. Mothers were sent home with an oxygen condenser and mask and encouraged to continue MH therapy for as long as possible each day.
Lilacs	1	Full texts/ 10 years	treatment AND congenital heart diseases AND	5n = 88), overall survival was 52%, and preterm infants had significantly worse survival (31%) compared to full-term newborns (56%). For children who survived to 1 year of age, long-term survival was ~90%.

Source: Authors,(2023)

According to the selected articles, hypoplasia of the left heart continues to be a congenital cardiac anomaly of concern for the medical field, even with the reduction in mortality.

There are prenatal interventions, such as fetal aortic valvuloplasty and maternal hyperoxygenation. According to Kovacevic et al. (2018), fetal aortic stenosis can progress to hypoplastic left heart syndrome, and fetal aortic valvuloplasty has been proposed to improve left heart hemodynamics and maintain biventricular circulation, however, such a procedure is associated with a 10% loss and increased prematurity, and therefore the risk-benefit ratio remains uncertain.

Maternal hyperoxygenation (MH), on the other hand, consists of providing supplemental oxygen to the mother during pregnancy to improve the cardiovascular hemodynamics of the fetus. The effect of MH is due to increased fetal pulmonary blood flow, which results in increased venous return to the left heart. This effect becomes more apparent with increasing gestational age. However, to date, there are no data on the long-term evolution of fetuses affected with the syndrome undergoing MH therapy, particularly with regard to possible harmful effects (LARA et al., 2016).

Regarding postnatal treatment, there has been an evolution in the immediate management at birth in the preservation of the clinical condition with more adequate systemic output, with the use of prostaglandin E1 and vasoactive drugs. In this context, the initial Norwood-Sano technique started to have a lower risk, and consequently a higher survival rate in this phase (ATIK, 2021; ROGERS et al., 2017).

However, the literature documents that stage 1 surgery is still recognized as technically challenging for pediatric cardiac surgery (ROGERS et al., 2017), since according to Bezerra et al. (2022) state that higher mortality occurs in the period between the Norwood and Glenn procedures, that is, a rate of 25% of deaths can occur. Pajak et al. (2017) also state that severe *preoperative* atrioventricular valve *regurgitation,* arrhythmias, and pneumonia/sepsis are closely correlated with mortality in patients with disease after second-stage palliation. It should be noted that most mortality occurs in the first year of life, with relative stability survival after 1 year of age (SIFFEL et al., 2015).

In addition, it is reported that multiple different factors may contribute to survival rates, including body weight and age at surgery, size and function of heart valves and chambers, native aortic size, and variables intrinsic to the surgical procedure (cardiopulmonary bypass (CPB time), shunt size, and shunt banding to control excessive pulmonary flow rate). Therefore, the verification and identification of these risk factors can contribute to the improvement of general definitions of treatment, surgical technique, and auxiliary therapeutic measures, aiming to improve survival rates (BEZERRA et al., 2022).

Regardless of the approach, traditional surgical-stage palliation or the hybrid procedure, survivals have greatly improved, and many these patients are surviving not only through Fontan in

early childhood, but also into adolescence and young adulthood. As this population grows, it becomes increasingly important to understand the long-term outcomes of these Fontan patients, not only in terms of survival but also in terms of disease burden, neurodevelopmental outcomes, psychosocial development, and quality of life (BEZERRA et al., 2022; ATIK, 2021; PAJAK et al., 2017; ROGERS et al., 2017).

However, there are other procedures currently available, as Burkhart et al. (2019) point out that direct administration of umbilical cord blood-derived mononuclear cells into the right ventricular myocardium at the time of stage II palliation in patients with the disease can be a viable and cost-effective regenerative product for the pediatric public, maximizing the long-term safety profile using a autologous.

CONCLUSION

It is concluded that surgical procedures are still considered gold standards for the care of this patient, however, prenatal cardiac interventions, such as fetal aortic valvuloplasty and maternal hyperoxygenation, are promising treatment options and, as well as stem cell therapy, provide important clues for the application of new approaches. In view of this, more public policies aimed at assisting patients in treatment are needed, without the use of financial resources, given the scarcity of such treatment in public health in Brazil.

This study has limitations, since this review is largely based on foreign studies and in the Brazilian literature there are few studies focused on the subject, therefore, the development of studies is necessary, since this can be used to optimize parental counseling, as well as the pre and postnatal management of affected children and disseminate knowledge about treatment. to minimize the cases of death due to this pathology.

REFERENCES

1. ATIK, Edmar. (2021). Hipoplasia do Coração Esquerdo em Evolução até 21 Anos, Após Operação Cavopulmonar Total Realizada com 5 Anos de Idade. *Arquivos Brasileiros de Cardiologia, 117*, 142-145.

2. BEZERRA, Rodrigo Freire et al. (2022). Resultados Precoces do Procedimento de Norwood em um Centro de Referência no Brasil. *Arquivos Brasileiros de Cardiologia, 119*, 282-291.

3. BURKHART, Harold M. et al. (2019). Autologous stem cell therapy for hypoplastic left heart syndrome: safety and feasibility of intraoperative intramyocardial injections. *The Journal of thoracic and cardiovascular surgery, 158*(6), 1614-1623.

4. DIONÍSIO, Maria Teresa et al. (2011). Síndrome do Coração Esquerdo Hipoplásico: 19 anos de diagnóstico pré-natal. *Diagnóstico Prenatal, 22*(1), 2-6. [Link](http://dx.doi.org/10.1016/j.diapre.2010.01.003)

5. FANTINI, Fernando A. et al. (2004). A operação de Norwood modificada para tratamento da síndrome de hipoplasia do coração esquerdo. *Revista Brasileira de Cirurgia Cardiovascular, 1*(19), 42-46.

6. KOVACEVIC, Alexander et al. (2018). Fetal hemodynamic response to aortic valvuloplasty and postnatal outcome: a European multicenter study. *Ultrasound in Obstetrics & Gynecology, 52*(2), 221-229.

7. LARA, D. A. et al. (2016). Pilot study of chronic maternal hyperoxygenation and effect on aortic and mitral valve annular dimensions in fetuses with left heart hypoplasia. *Ultrasound in Obstetrics & Gynecology, 48*(3), 365-372.

8. NERY, Ascom Hospital Ana. SÍNDROME DA HIPOPLASIA DO CORAÇÃO ESQUERDO: cardiopatia congênita grave. Disponível em: [Link](https://ver.han.net.br/sindrome-da-hipoplasia-do-coracao-esquerdo-cardiopatia-congenita-grave/). Acesso em: 22 nov. 2021.

9. PAJAK, Jacek et al. (2017). Preoperative single ventricle function determines early outcome after second-stage palliation of single ventricle heart. *Cardiovascular Ultrasound, 15*(1).

10. ROGERS, Libby et al. (2018). Interventional treatments and risk factors in patients born with hypoplastic left heart syndrome in England and Wales from 2000 to 2015. *Heart, 104*(18), 1500-1507.

11. SHENOY, Rajesh U.; PARNESS, Ira A.. (2014). Hypoplastic Left Heart Syndrome. *Journal Of The American College Of Cardiology, 64*(19), 2036-2038. [Link](http://dx.doi.org/10.1016/j.jacc.2014.09.018)

12. SIFFEL, Csaba et al. (2015). Survival of Children With Hypoplastic Left Heart Syndrome. *Pediatrics, 136*(4), 864-870. [Link](http://dx.doi.org/10.1542/peds.2014-1427)

13. SIFFEL, Csaba et al. (2015). Survival of children with hypoplastic left heart syndrome. *Pediatrics, 136*(4), e864-e870.

Protective effect of apolipoprotein AI mimetic peptide 4F on renal and cardiac injury and endothelial dysfunction induced by acute myocardial infarction in hypercholesterolemic rats receiving iodinated contrast

https://doi.org/10.56238/sevened2024.005-019

Roberto de Souza Moreira[1], Maria Claudia Costa Irigoyen[2], José Manuel Condor Capcha[3], Talita Rojas Cunha Sanches[4], Paulo Sampaio Gutierrez[5], Margoth Ramos Garnica[6], Irene de Lourdes Noronha[7] and Lúcia da Conceição Andrade[8]

ABSTRACT

Moreira, R.S, Irigoyen, M.C, Capcha, J.M.C, Sanches, T.R, Gutierrez, P.S, Garnica, M.R, Noronha, I.L, Andrade, L. Protective effect of apolipoprotein AI mimetic peptide 4F on renal and cardiac injury and endothelial dysfunction induced by acute myocardial infarction in hypercholesterolemic rats receiving iodinated contrast.

INTRODUCTION: The use of contrast after angiography in infarcted animals induces acute kidney injury, being associated with worsening prognosis and increased mortality. Hypercholesterolemia is an aggravating factor of endothelial injury in acute myocardial infarction (AMI) and the use of contrast in diagnosis and treatment can cause acute kidney injury. Treatment with the apolipoprotein AI mimetic peptide 4F can reverse endothelial injury by reducing LDL levels and preventing its oxidation. OBJECTIVES: To analyze the effect of Apo A-I (using mimetic peptide 4F) on cardiac and renal injury induced by acute myocardial infarction (AMI) with contrast therapy in hypercholesterolemic rats. METHODS: This was a prospective study with rats on a diet at 4% cholesterol for 8 days, divided into a SHAM group operated without coronary ligation (n=6) or infarcted animals with ligation of the left anterior descending coronary artery, with or without the use of contrast and treatment 6 hours after infarction induction: AMI (n=15), AMI+C (iopamidol 2.9 g/kg body weight, intrafemoral artery injection n=15), AMI+4F (4F, 10mg/kg body weight, peritoneal injection, n=8) and AMI+C+4F (n=8). All results are analyzed after 24 AMI and expressed as mean and standard error. RESULTS: It was observed that the AMI+4F and AMI+C+4F groups showed a better response to cardiac injury and renal injury compared to the AMI and AMI+C groups. There was an improvement in renal function through 12-hour creatinine clearance, increased expression of eNOS, increased VEGF, preservation of mitochondrial morphology, reduction of inflammation with a lower expression of CD68+ (macrophages), decreased positive tunnel cells associated with an increase in apolipoprotein AI (Apo AI) expression in renal tissue. The same happened in cardiac function with decreased plasma troponin, increased expression of eNOS, VEGF, isolectin B4, reduction in inflammation represented by lower TLR4 expression, positive tunnel cells,

[1] Adjunct Professor at UFCAT / Postdoctoral Fellow at FMUSP
ORCID: https://orcid.org/0000-0002-7496-9178
[2] Collaborating Professor of the Department of Cardiopneumology and Advisor of the PPG in Cardiology and Experimental Pathophysiology at the Medical School of the University of São Paulo.
ORCID: https://orcid.org/0000-0003-2097-3662
[3] Post Doctoral Researcher University of Miami Coral Gables, United States
SLATS: http://lattes.cnpq.br/6031667171644406
[4] Biologist at the Medical Research Laboratory 12. Since 2003 I have been part of the LIM12 research group at the Faculty of Medicine of the University of São Paulo.
ORCID: https://orcid.org/0000-0001-7533-859X
[5] Assistant Physician (Pathological Anatomy) of the Heart Institute of the Hospital da Clínicas da F M U S P
ORCID: https://orcid.org/0000-0002-9544-2359
[6] Biologist at Hospital da Clínica de São Paulo and FMUSP
ORCID: https://orcid.org/0000-0003-3713-673X
[7] Full Professor and Head of the Department of Nephrology, Department of Internal Medicine, Medical School, USP School
ORCID: https://orcid.org/0000-0002-3208-4435
[8] Associate Professor of Nephrology, Department of Internal Medicine, Medical School, USP School of Medicine
ORCID: https://orcid.org/0000-0002-3078-8957

improved cholesterol profile, preservation of mitochondrial morphology and associated with increased expression of Apo AI in cardiac tissue. Hemodynamics were preserved with improvement in cardiac output, ejection fraction, baroreflex response, left ventricular end-diastolic pressure, and associated with a decrease in the infarct area measured by both echocardiogram and immunohistochemistry. We demonstrate that treatment with apolipoprotein AI can be a therapeutic option in cardiac and renal injury by reversing the inflammatory response through the efflux of HDL-dependent cholesterol.

Keywords: Apolipoprotein, Hypercholesterolemia, Contrast, Acute myocardial infarction/surgery, Acute kidney injury, Contrast nephropathy.

INTRODUCTION

MECHANISMS OF HYPERCHOLESTEROLEMIA;

The effects of hypercholesterolemia act on the proliferation and differentiation of hematopoietic stem cells/progenitor cells (CEPH). In addition, dyslipidemia also acts on neighboring cells of the CEPH and causes inflammation, arteriosclerosis and cardiovascular diseases. [1, 2, 3]

Hypercholesterolemia is associated with phenotypic changes in endothelial cell function that lead to a pro-inflammatory and pro-thrombotic state in different segments of the microcirculation. [4, 5]

Atherogenesis follows three phases, being endothelial dysfunction, fatty plaque formation, and fibrous capsule development. The most discussed hypothesis for its etiology is that the initial lesion occurs in response to an alteration of the endothelium caused by disturbances in blood flow (shear stress), the presence of oxidized lipids in lipoproteins, or the presence of some infectious agent. [6]

EFFECTS OF ATHEROSCLEROSIS IN AN ANIMAL MODEL;

Systemic sclerosis related to a diet high in cholesterol causes an autoimmune disease of the connective tissue characterized by decreased vascular function, increased oxidative stress, impaired angiogenesis and inflammation in the internal organs developing crosstalk mainly related to kidney function.[7, 8]

Studies using a myocardial infarction model in hypercholesterolemic rats have shown an increase in LDL compared to HDL, mimicking the situation found in humans.[9] Animals fed a high-cholesterol diet showed a worsening of ventricular remodeling compared to animals fed a normal diet. This study demonstrates that the hypercholesterolemic diet can impair heart function leading to a decrease in effective cardiac output and harming other organs. [9, 10]

High cholesterol in a rat model of hropercholesterolemia showed an increased myocardial vulnerability with worsening of the infarct area, significant alteration in the number of apoptotic cells and associated with the activation of endoplasmic reticulum stress pathways.[11, 12]

ALTERATIONS OF ACUTE MYOCARDIAL INFARCTION;

In the presence of an acute myocardial infarction, there is a process of ischemia of the myocardial muscle, which can lead to necrosis of part of the musculature due to lack of adequate supply of oxygen and nutrients, leading to apoptosis of the heart cells.[13]

Myocardial infarction is one of the main causative agents of heart failure, with a high rate of morbidity and mortality, leading to a high cost treatment in public hospitals, and with the increase in the perspective of age, this cost tends to increase. Despite therapeutic advances in treatment, the

prognosis is still poor, which can lead to death in a short period of time or heart failure. Studies with new therapeutic interventions are essential for advances in the treatment of the disease.[14]

The choice of a model of acute myocardial infarction in animals that determines physiological changes found in clinical cases with humans is extremely important for understanding cardiovascular diseases. In the same AMI model we used, baroreflex sensitization, reduced cardiac parasympathetic modulation, and increased cardiovascular sympathetic modulation were confirmed.[15]

Echocardiogram examination is a reliable and commonly used method to examine cardiovascular diseases. This modern technology offers a new opportunity to study cardiac dysfunction after acute myocardial infarction (AMI) in rats. Cardiovascular function parameters can provide a detailed prognosis of ejection fraction, cardiac output and especially infarct area in animals.[16, 17]

Troponin I (cTnI) plays an important role in the evaluation of the ischemic area and prognosis of the patient. In an animal model, the peak of troponin I alteration was demonstrated 24 hours after infarction induction and the correlation of infarct expansion area with worsening of this marker in rats. It has been identified as an excellent marker of myocardial injury in rats associated with the prognosis of treatment.[18, 19]

In infarction, the activation of leukocytes induces the release of pro-inflammatory cytokines, which in the acute phase cause alteration of the immune system and propagation of the systemic inflammatory response, leading to intravascular and hemodynamic dysfunction.[20]

In a rat model of AMI with ligation of the anterior descending coronary artery of the left ventricle, after twenty-four hours the animals showed a significant decrease in ejection fraction associated with the increase in infarct area and reproducing what occurs in humans.[21]

Acute myocardial infarction associated with hypercholesterolemia in an animal model showed a significant worsening in the untreated group with an increase in LDL, triglycerides and decreased HDL in plasma. A significant reduction in the expression of e-NOS and VEGF, and an increase in the infarct area with apoptosis in the cardiac tissue of rats. [22]

Myocardial ischemia alone in an animal model has already led to significant alteration in cardiac tissue, demonstrating an increase in TLR4 (Toll-like receptor 4), which is an important inducer of apoptosis, demonstrated through the P38 pathways, MAPK, Bax, Bcl-2, cleaved caspase-3 and c-Jun/AP-1.[23]

THE RISKS OF USING LOW MOLECULAR WEIGHT CONTRAST

Despite the measures to protect renal function in the examination of catheterizations or angioplasty, the use of low molecular weight contrast in acute myocardial infarction (AMI) is related

to a worsening of renal function in high-risk patients who have several underlying diseases associated with dyslipidemia and is related to a high risk of mortality.[24]

Contrast-induced nephrotoxicity (CIN) has been discussed as one of the causes of acute kidney injury (AKI) in in-hospital patients. In patients with risk factors, the incidence is much higher, with a 25% increase in baseline creatinine in a period of 48 to 72 hours after the use of contrast. Decreased glomerular filtration rate (GFR) may lead to the use of hemodialysis therapies that are invasive and contribute to worsening prognosis.[25]

Heart failure with reduced effective arterial volume may lead to a higher risk of AKI in the use of low molecular weight contrast, especially in the use of vasoactive drugs that potentiate the action of nephrotoxicity.[26]

In an experimental study with hypercholesterolemic rats, animals that received low molecular weight contrast showed a worsening of renal function compared to animals that did not.[27] In a model of nephrectomy of the right kidney and ischemia with renal reperfusion in rats, hypercholesterolemic animals showed a decrease in HDL associated with an increase in LDL, and when submitted to renal ischemia, they presented a worsening of renal function measured by inulin clearance.[28]

Using a model of contrast-induced nephropathy in rats, they administered a dose of 2.9 g/kg of iopamidol and demonstrated a worsening of renal function measured by the increase in tubular necrosis.[29] In a model of contrast-induced kidney injury, rats showed a worsening of renal function as measured by creatinine clearance, which was maintained even after six days of use and is related to apoptosis of tubular cells in the kidney.[30]

In another study of contrast-induced nephropathy with the use of a dose of 2.9 g/kg of iopamidol, rats showed apoptosis of epithelial cells in renal tubules by activation of the JnK (Jun N-terminal kinase) and P38 (mitogen-activated protein kinase) pathways, and the use of contrast was related to the inflammatory process, apoptosis and renal injury.[30, 31]

CROSSTALK BETWEEN HEART AND KIDNEY IN THE USE OF CONTRAST

Crosstalk is a cross-activation between a primary lesion and dysfunctions to the other organs. In patients with low cardiac output, there was a significant increase in plasma creatinine on angiography with contrast.[32]

Decreased effective renal artery blood flow and vasoconstriction are considered major mechanisms of acute kidney injury. The use of contrast in addition to low cardiac output after suffering an acute myocardial infarction is associated with a worsening of renal function.[32, 33]

However, hypercholesterolemia is also associated with worsening renal function, and studies show that an increase in creatinine during acute myocardial infarction increases the risk of mortality

in patients independent of other conventional risk factors. Not to mention the use of contrast, which can further aggravate the patient's condition at a time of hemodynamic instability.[34]

Increased plasma creatine is associated with increased infarct area in patients who have experienced acute myocardial infarction.[35]

Acute myocardial infarction leads to a chronic heart disease causing heart failure, acute kidney injury can cause a long-term chronic kidney disease and considering this scenario cardiorenal syndrome and a possibility of worsening in patients with crosstalk.[36, 37]

Patients who have increased risk factors during the invasive procedure with the use of contrast in diagnostic or interventional examination may develop acute kidney injury when not properly treated.[38]

HEMODYNAMIC STUDY OF HEART RATE (HR), ARTERIAL PRESSURE (BP) AND BARORECEPTORS IN MYOCARDIAL INFARCTION

Hemodynamic control in myocardial infarction is important to reduce ischemic complications and avoid myocardial overload. Blood pressure at normal levels is critical for maintaining tissue and organ perfusion.[39]

Impaired baroreflex function is a factor responsible for poor prognosis in patients with acute myocardial infarction. In a time of cardiac stress, the maintenance of cardiovascular homeostasis is dependent on the action of arterial pressoreceptors, cardiopulmonary receptors that reduce cardiovascular distress.[40]

Either the sympathetic system that controls the vessels and heart through efferent fibers, or the parasympathetic system using the vagus nerve to the heart. These commands, controlled by the aortic and carotid pressoreceptors, are responsible for the efficient maintenance of cardiac output and peripheral resistance.[41]

Pressoreceptors can increase parasympathetic activity by acting on the regulation of heart rate and blood pressure. The regulation of cardiac vagal tone is modulated by pressoreceptors, which is responsible for resting vagal tone in the animal when awake and using breathing voluntarily and always remembering that chemoreceptors and other reflexes associated with the animal's breathing can alter the activity of the parasympathetic system.[42]

Cardiovascular diseases, in a general context, present alterations in sympathetic activity that are better known and studied. However, there is a consensus on the parasympathetic system, relating preserved vagal function to adequate maintenance of blood pressure variability and better protection of target organs.[43]

Heart rate variability can determine a patient's prognosis, when it is reduced it increases the risk of sudden death during acute myocardial infarction.[44]

HIGH-DENSITY LIPOPROTEIN (HDL);

The control of HDL levels has been useful for assessing cardiovascular risk and studies have shown the correlation between inflammation and HDL dysfunction. Functional measurements of HDL levels contribute important information about the activity of the molecule and are involved in atherogenesis, inflammation, and infection.[45, 46]

The anti-atherosclerotic action is associated with several mechanisms of protection of the HDL molecule, as demonstrated in a study in the European population: high HDL levels decrease the risk of cardiovascular diseases even in type 2 diabetic patients. [47]

Cellular cholesterol efflux plays an important role in reverse cholesterol transport (CRT), which occurs in active or passive diffusion mechanisms. Among the active processes are those involving the interaction of HDL, where mature HDL2 and HDL3 molecules are generated from the free lipids of apo AI or lipids poor in pre-beta HDL. These precursors are produced as nascent HDL from the liver, intestine or are released from the lipolyzed VLDL molecule and chylomicrons.[48]

Cholesterol is actively pumped out of cells by the ATP-binding cassette transporter A1 (ABCA1), mediated by lipid efflux and phospholipid transfer protein (PLTP) in lipid-poor apo AI. Lecithin-cholesterol acyltransferase (LCAT), which esterifies cholesterol in HDL, plays an important role in CRT because cholesteryl esters are much more hydrophobic than cholesterol and become trapped in the nuclei of cholesterol molecules.

A portion of the free lipid of apo A-I undergoes glomerular filtration in the kidneys. [48, 49]

PROTECTIVE ACTION OF LIPOPROTEINS;

High-density lipoproteins (HDL) are involved in cholesterol efflux. The mechanism of action of HDL is still not well understood, due to the lack of information about the structure of the molecule. In its composition we find apolipoproteins that are part of the HDL molecule and its fractions, and are contained in lipoprotein particles. They play important roles in lipoprotein metabolism, such as transport of these hydrophobic molecules in the plasma aqueous medium, binding to specific receptors on the cell surface, and activation or inhibition of enzymes involved in lipid metabolism.[50, 51]

Apolipoprotein A-I (apo A-I) is the largest component of the high-density lipoprotein (HDL) particle, contains about 190-243 amino acids in its composition, acts as a cofactor for the enzyme lecithin cholesterol acetyltransferase, and plays a key role in lipid binding and HDL molecule formation. It also acts as a mediator in the transfer of cholesterol from cells to HDL particles and its plasma concentration of apo A-I is strongly associated with HDL.[52-54]

THE USE OF APOLIPOPROTEIN AI MIMETIC PEPTIDE 4F;

The search for peptides smaller than apo A-I, but with the same lipid-binding properties, led to the synthesis of a peptide with 18 amino acids. Its sequence (D-W-L-K-A-F-Y-D-K-V-A-E-K-L-K-E-A-F) is not identical to the original structure of apo A-I, however it has a formation of amphipathic α-helices similar to those found in apo A-I and mimics many of the lipids of apo A-I.[55]

4F is the main mimetic peptide of Apo A-1. It has been shown to play an important role in inflammatory states.[56]

The 4F mimetic peptide (4F) features 4 strongly hydrophobic phenylalanine residues that allowed greater penetration of water molecules into the hydrophobic environment. The penetration of the 4F mimetic peptide occurs through phosphatidylcholine, a phospholipid present in cell membranes and demonstrated through in vitro studies that proved the presence of 4F inside cells.[55, 57]

Plasma HDL concentrations decrease with age in prospective studies. Decreased HDL concentration and function may occur secondary to hormonal changes, inflammatory processes, and diabetes mellitus. In addition to these specific effects, the aging process may be involved with a decrease in the concentration of HDL and its functions. HDL deficiency is extremely rare among centenarians. HDL can modulate the aging process, not only because of its well-known antiatherogenic function, but possibly also because it directly interferes with aging by signaling proteins such as klotho. Most of the current results, however, are based on cell culture and experiments with transgenic animals. There are no studies on models *in vivo*.[58]

The anti-inflammatory and anti-atherogenic effects of 4F are due to the elevation of HDL formation, increased cholesterol efflux and reduced lipoprotein oxidation. In addition, improvement of arterial vaso-reactivity is also an important function of the .4F[46] Currently, plasma levels of apolipoproteins A-I have been described as better predictors of atherosclerotic diseases. Oral administration of apo A-I 4F dramatically inhibits atherosclerosis in mice independent of changes in plasma HDL and total cholesterol levels.[59]

A recent study showed that administering apo A-I (4F) to mice resulted in an increase in HDL, a reduction in lipoprotein lipid peroxides, an increase in cholesterol efflux, a decrease in inflammatory cells, a reduction in plasma LDL levels, and activation of the paraoxonase pathway, favoring the conversion of pro-HDL molecules with anti-inflammatory action.[60]

A study with the use of apo A-I D-4F improved the healing of endothelial lesions of carotid arteries in mice in the hypercholesterolemia model. It showed a significant decrease in oxidative stress and improvement in lipid oxidation. [61]

Apo A-I 4F protected against atherosclerosis in an animal model. Mechanisms include reverse cholesterol transport, removal of low levels of oxidized lipids, and preventing LDL

oxidation. Intraperitoneal administration of apo A-I 4F enhanced HDL's ability to protect against LDL oxidation in a diet-induced atherosclerosis model in mice.[62]

There was no difference in oral or intraperitoneal administration, both showed a significant improvement in atherosclerotic lesion in an apo-null mouse model with graft from the inferior vena cava in the right carotid.[63]

In some review studies with the use of apo A-I 4F, the positive action of the synthetic peptide in the prevention and reduction of atherosclerosis in animal models was confirmed. Its positive effect has been demonstrated in rats, mice, monkeys, and rabbits.[64-66]

Even in a model of cardiac hypertrophy in mice, with prolonged use of a hypercholesterolemic diet, the protective action of apo A-I 4F was confirmed through the improvement of cardiac function, increase of HDL and decrease of LDL.[67]

This drug may show benefits especially in acute coronary syndrome and exerts a protective function in systemic inflammatory response syndrome.[68]

Experimental studies have shown proven benefits on cardiovascular function, with an increase in antioxidant and anti-inflammatory molecules, and an increase in paraoxonase and eNOS.[69-71]

Recently, I demonstrated through a study conducted with rats in the sepsis model, the intraperitoneal administration of apo A-I 4F promoted the formation of new HDL particles. This study demonstrated improved cardiac performance, kidney function, and increased survival of the mice.[66, 72]

Pharmacokinetic and pharmacodynamic studies in the oral use of apo A-I 4F were conducted, testing the safety of the peptides in humans. The results were satisfactory, with an increase in HDL and an improvement in its anti-inflammatory activity. [73]

Some pharmaceutical companies of great importance in the world market are already testing the use of apolipoprotein AI in humans, phase 1, 2 and 3 clinical trials are already underway, demonstrating the importance of using this peptide in future treatments.[74]

Currently, the study of peptide 4F is already in the preclinical phase for the treatment of coronary heart disease and atherosclerosis.[75]

The beneficial effects of HDL on atherosclerosis have been attributed to apo A-I. It can be used as a therapeutic intervention. However, as it is a very large protein, it is very difficult to produce and is also extremely expensive. Due to this problem, Apo A-I mimetic peptides have been produced that can be used in the treatment of atherosclerosis with therapeutic success of reducing atheroma plaque and improving myocardial vascularization.[74, 76]

Apolipoprotein A-I was investigated in a randomized, double-blind, multicenter study, and the pharmacokinetic and pharmacodynamic safety of the infusion in patients with stable

atherosclerotic disease was evaluated. The results showed a favorable overall safety, without the presence of hepatic and renal toxicity and with an increase in the concentration of apo A-I in the plasma, improving the cholesterol efflux.[77]

In a recent study, it was demonstrated that the use of the bromodomain and extraterminal domain (BET) inhibitor, increases the production of transcription of the Apo A-I gene in humans, showed an increase in the number of HDL molecules associated with apo A-I with effective action in the improvement of pro-inflammatory, pro-atherosclerotic and pro-thrombotic pathways that may contribute to the risk of Cardiovascular Disease.[78]

HIP

Based on the scientific evidence analyzed, we hypothesized that hypercholesterolemic, infarcted and contrast-enhanced rats could present cardiac and renal manifestations similar to those observed in hospitalized patients. It is worth noting that the previous treatment of cardiac and renal lesions is essential for the prognosis of patients.[79]

.

OBJECTIVE

The main objective of this project was to analyze the effect of Apo A-I (using mimetic peptide 4F) on cardiac and renal injury induced by acute myocardial infarction (AMI) with contrast therapy in hypercholesterolemic rats.

SPECIFIC OBJECTIVES

- To interpret cardiac structural and functional parameters by transthoracic echocardiography in 8-week-old Wistar rats, infarcted hypercholesterolemic animals, as well as infarcted hypercholesterolemic animals using contrast with and without 4F apo AI treatment and comparing them to controls.
- To identify morphological alterations of the mitochondria of the heart and kidney in 8-week-old Wistar rats, infarcted hypercholesterolemic animals, as well as hypercholesterolemic infarcted animals with the use of contrast with and without 4F apo AI treatment and comparing them to controls.
- To verify whether the expression of apo AI 4F is increased in the heart and kidney of 8-week-old Wistar rats, sham animals, hypercholesterolemic infarcted animals, as well as hypercholesterolemic animals infarcted with contrast and comparing them to animals treated with apo AI 4F.
- To provide data on lipid metabolism disturbance in 8-week-old Wistar rats, infarcted hypercholesterolemic animals, as well as hypercholesterolemic infarcted animals with

contrast therapy with and without 4F apo AI treatment and comparing them to controls.

- To investigate the inflammatory response and angiogenesis mechanisms involved in the vascular system of the heart and kidney of 8-week-old Wistar rats, infarcted hypercholesterolemic animals, as well as hypercholesterolemic infarcted animals with contrast with and without 4F apo AI treatment and comparing them to controls.
- To control left ventricular end-diastolic pressure (LVEDP), vasomotor response, baroreflex in 8-week-old Wistar rats, infarcted hypercholesterolemic animals, as well as infarcted hypercholesterolemic animals with the use of contrast with and without 4F apo AI treatment and comparing them to controls.

MATERIALS AND METHOD

The experimental procedures were developed in accordance with the institutional guide for laboratory care and use, with the approval of the Ethics Committee on the Use of Animals (FMUSP – CAPPESQ) School of Medicine of the University of São Paulo, Brazil/ Ethics Committee for Analysis of Research Projects (#261/13).

The animal model used in our project consists of a strain of male Wistar rats with weights between 200 – 250g and about 8 weeks of age were obtained from the Central Vivarium of the Faculty of Medicine of the University of São Paulo (FMUSP). The animals were kept separately in an environment with controlled temperature (22 – 24ºC) and light (12-hour light/dark cycle). They had free access to water and the hypercholesterolemic diet was prepared according to the standard diet for rodents AIN-93G and modified by replacing 3.5% of soybean oil with hydrogenated fat and adding 4% of cholesterol and 0.4% of cholic acid.[80]

The animals were randomly divided into five groups listed below.

We used the AMI (acute myocardial infarction) model described by Pfeffer et al, 1979.[81]

EXPERIMENTAL SEQUENCE;

All animals received a 4% cholesterol diet and were separated into 5 groups:

3.1.1). Sham **(S);**

3.1.2). Infartado **(I);**

3.1.3). Contrast infarction **(CI);**

3.1.4). Infarctionary treated with APO AI 4F **(I+4F);**

3.1.5). Contrast-enhanced infarction treated with APO AI 4F **(IC+4F).**

The above-mentioned experimental groups were studied after five distinct periods: 8th day, 00h on the 9th day, 6h on the 9th day, 12h on the 9th day and 10th day. It is important to emphasize that infarcted animals were included in the protocol only when an area of akinesia was confirmed (by

echocardiography) and troponin examination 24 hours after the surgical procedure to induce infarction. It should also be noted that those with a minimum of 15% of akinesia area in the 24 hours were considered for the study.

Next, procedures common to all studies will be presented. It should be noted that this methodological sequence presented will be maintained in the presentation of the results and in their discussion.

Sham Group 8 Days Cholesterol 4% Diet (SHAM);

0h: Weighing, cannulation of the femoral artery and vein.

6h: The volume of the 0.9% DES vehicle was administered intravenously (IV) using a femoral artery for each animal and were equivalent to the volume of the 0.9% SF vehicle administered intraperitoneally (ip) for each animal and were equivalent to the volume of the Apo AI 4F.

12 noon: Beginning of diuresis control for 12 hours in a metabolic cage.

24h: Blood pressure, heart rate (30 min) recording, baroreflex sensitivity assessment, echocardiographic evaluation and left ventricular end-diastolic pressure measurement, and euthanasia to remove plasma for biochemical analysis and tissue for molecular biology analysis.

Group 8 days of diet 4% Infarcted Cholesterol (AMI);

0h: Weighing, artery and vein cannulation and AMI

6h: The volume of the 0.9% DES vehicle was administered intravenously (IV) using a femoral artery for each animal and were equivalent to the volume of the 0.9% SF vehicle administered intraperitoneally (ip) for each animal and were equivalent to the volume of the Apo AI 4F.

12 noon: Beginning of diuresis control for 12 hours in a metabolic cage.

24h: Blood pressure, heart rate (30 min) recording, baroreflex sensitivity assessment, echocardiographic evaluation and left ventricular end-diastolic pressure measurement, and euthanasia to remove plasma for biochemical analysis and tissue for molecular biology analysis.

Group 8 days of diet 4% Contrast Infarction (AMI+C);

0h: Weighing, artery and vein cannulation and AMI

6 a.m.: Injection of iopamidol contrast 2.9 g iodine/kg body weight in the femoral artery and volume of the vehicle with 0.9% DES was administered by ip, for each animal, and were equivalent to the volume of Apo AI 4F.

12 noon: Beginning of diuresis control for 12 hours in a metabolic cage.

24h: Blood pressure, heart rate (30 min) recording, baroreflex sensitivity assessment, echocardiographic evaluation and left ventricular end-diastolic pressure measurement, and euthanasia to remove plasma for biochemical analysis and tissue for molecular biology analysis.

Group 8 days of 4% cholesterol diet Infarction, treated with APO AI 4F (AMI+4F);

0h: Weighing, artery and vein cannulation and AMI

6 a.m.: The volume of the 0.9% DES vehicle was administered intravenously, using a femoral artery, to each animal and were equivalent to the contrast volume. They received treatment with APO AI IP/10mg/kg.

12 noon: Beginning of diuresis control for 12 hours in a metabolic cage.

24h: Blood pressure, heart rate (30 min) recording, baroreflex sensitivity assessment, echocardiographic evaluation and left ventricular end-diastolic pressure measurement, and euthanasia to remove plasma for biochemical analysis and tissue for molecular biology analysis.

Group 8 days of diet cholesterol 4% Contrast Infarction Treated with APO AI 4F (AMI+C+4F);

0h: Weighing, artery and vein cannulation and AMI

6h: Injection of iopamidol contrast 2.9 g iodine/kg body weight in the femoral artery and treatment with APO AI IP/10mg/kg.

12 noon: Beginning of diuresis control for 12 hours in a metabolic cage.

24h: Blood pressure, heart rate (30 min) recording, baroreflex sensitivity assessment, echocardiographic evaluation and left ventricular end-diastolic pressure measurement, and euthanasia to remove plasma for biochemical analysis and tissue for molecular biology analysis.

INFARCTION INDUCTION

The animals were weighed and anesthetized with a mixture of Ketamine (50 mg/Kg) and Xylazine (12 mg/Kg) intraperitoneally, placed in the supine position and intubated (gelco-14G). A small cut was made in the skin, and the pectoral muscles were pulled apart. The animal was submitted to artificial respiration (Intermed, Inter 3, São Paulo, SP) and a left thoracotomy was performed in the fourth intercostal space, with a retractor placed between the ribs for better visualization.

The pericardium was opened and the left atrium was moved away to visualize the anterior interventricular vein as a reference to the artery. The procedure for the ligation of the anterior interventricular artery consisted of the passage of a wire under the vein, reaching part of the

musculature, where the artery is located. This was ligated (6.0 mononylon thread) causing ischemia of the adjacent tissue.

After coronary ligation, the thoracotomy was closed (4.0 mononylon thread) and the pneumothorax was removed. The separated muscles were repositioned and the skin was sutured (4.0 mononylon thread). Soon after the animal's recovery and the onset of reflexes suppressed by the action of anesthetics, the animal was removed from artificial ventilation and breathed in a heated environment for recovery. It was administered intramuscularly with 30000 IU benzylpenicillin24**.** (Figure 1).

HEMODYNAMIC MEASUREMENTS

Blood pressure and heart rate measurements in rats 24 hours after surgical procedure induction (AMI);

The analysis of pressure signals was performed using a commercial program associated with the acquisition system. This program allowed the detection of maxima and minima of the pressure curve beat by beat, providing the systolic blood pressure (SBP) and diastolic blood pressure (DBP) values by the integral of the area under the curve in time. Heart rate (HR) was determined from the interval between two systolic peaks. The results were presented as mean values and standard deviations of the periods in which the data were analyzed for BP and HR. The data sheets obtained were analyzed in a commercial program for analysis (Excel 5.0), where the mean and standard deviation of BMP, SBP, DBP and HR were calculated for each animal. MAP variability was calculated using the mean of the standard deviations of each animal studied. The mean arterial pressure variability coefficient was obtained by means of the ratio of MAP variability to the mean arterial pressure value of each animal under study.[25th]

EVALUATION OF THE PRESSORECEPTOR REFLEX;

After MAP recording and the animals had remained at rest for 15 minutes, the sensitivity of the pressoreceptors was tested by infusion of phenylephrine and then sodium nitroprusside. Phenylephrine (Sigma Chemical Company, St. Louis, MO, USA), a potent α1 stimulator whose predominant action occurs in peripheral arterioles causing vasoconstriction, was injected in increasing doses into the femoral vein cannula. This drug was used, therefore, to cause an increase in blood pressure, an effect that causes subsequent reflex bradycardia, commanded by the pressoreceptors.

The opposite effect, i.e., a reduction in blood pressure with a tachycardia response, also commanded by the pressoreceptors, was caused by the injection of increasing doses of sodium nitroprusside (Sigma Chemical Company, St. Louis, MO, USA), a potent vasodilator of both

arterioles and veins, whose action occurs through the activation of guanylate cyclase and increased synthesis of 3', (minutes)- guanosine monophosphate (cyclic GMP) in the smooth muscle of vessels and other tissues.5'

To evaluate the sensitivity of the pressoreceptors, the maximum or minimum peak MAP was reduced from the MAP values of the control period. In the same way, the maximum variation of heart rate was reduced from the heart rate values of the control period, immediately before the infusion of the drugs, for later quantification of the responses. Baroreflex sensitivity was assessed by the index calculated by dividing the HR variation by the MAP variation.[25th]

STATISTICAL ANALYSIS

Data are expressed as mean ± standard error or mean ± standard deviation. Differences between the means of the multiple parameters were analyzed by the One-Way ANOVA method followed by the Newman-Keuls test. The statistical program used was GraphPrism 5.0. Values of $p < 0.05$ were considered statistically significant.

RESULTS

BIOCHEMICAL DATA

Table 1 below presents the biochemical data. As can be seen, there was a significant improvement in serum creatinine in AMI and AMI + C animals treated with 4F compared to animals with AMI and AMI+C not treated. Treatment with completely reversed this alteration.4F

Table 1 also shows an increase in serum levels of hepatic enzymes in animals infarcted with contrast, demonstrating hepatic dysfunction, with significant recovery of the alteration with the treatment of peptide 4F. Similarly, there was a significant increase in serum lactate in the AMI + C group. It is important to observe the levels of Triglycerides, Total Cholesterol, VLDL, LDL and HDL in animals with infarction. There is a significant increase in triglycerides, total cholesterol, VLDL and LDL, and a decrease in HDL in this model of contrast-enhanced AMI. Treatment with significantly reversed all changes, especially in the decrease in LDL and increase in HDL.4F4F

Table 1. Biochemical data in animals with 24-hour AMI or SHAM.

	SHAM	IAM	IAM+C	IAM+4F	IAM+C+4F
Creatinine (mg/dl)	0.27±0.02	0,57±0,04 [a,b,c]	0,65±0,04 [a,b,c]	0,38±0,02 [e]	0.39±0.02g
Urine volume (ml/12h)	0.02±0.002	0,006±0,001e,f	0,009±0,002f,k	0.02±0.005	0.03±0.004

Sodium excretion fractions (FENa %)	0.127±0.09	0.196±0.09	0.299±0.07	0.176±0.08	0.245±0.07
Potassium excretion fraction (FEK%)	14.9±1.88	19.6±8.44	27.0±7.96	22.2±8.07	22.8±8.35
Urinary osmolality (mOsm/kg)	860.1±84.6	1019.0±220.8	674.9±178.1	806.8±314.2	836.0±341.8
Lactate (mmol/l)	1.54±0.12	2,4±0,11 [j,k,l]	2,66±0,2 [g,h,l]	1.74±0.2	1.87±0.2
Triglicerídeos (Mg/dl)	39.8±8.5	114,1±14,6d,e,f	120,0±13,6d,e,l	43.9±11.6	62.58±13.6
Colesterol total (mg/dl)	95.7±7.5	145,0±10,5j,k,l	154,8±9,42g,h,i	93.8±11.4	100.9±14.0
VLDL (mg/dl)	7.1±0.8	23,7±0,95a,b,c	25,3±1,2a,b,c	8.62±2.1	11.1±2.8
LDL (mg/dl)	35.5±4.2	118.5±4.8a,b,c	120.9±5.4a,b,c	42.7±7.3j	62.2±5.2j
HDL (mg/dl)	44.0±4.3	57.5±10.7	42.3±9.9h,i	77.8±3.9g	72.6±4.1g

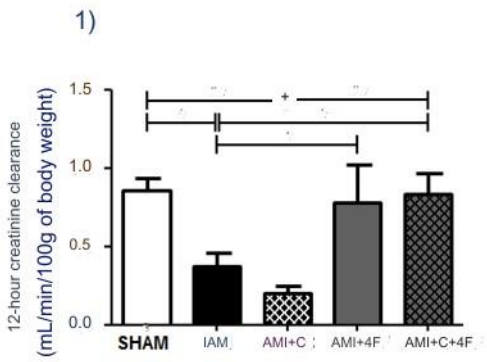
[a] $p < 0,0001$ vs. Sham; [b] $p < 0,0001$ vs. IAM+4F; [c] $p < 0,0001$ vs. IAM+C+4F; [d] $p < 0,001$ vs. Sham; [e] $p < 0,001$ vs. IAM+4F; [f] $p < 0,001$ vs. IAM+C+ 4F; [g] $p < 0,01$ vs. Sham; [h] $p < 0,01$ vs. IAM+4F; [i] $p < 0,01$ vs. IAM+C+4F; [j] $p < 0,05$ vs. Sham; [k] $p < 0,05$ vs. IAM+4F; [l] $p < 0,05$ vs. IAM+C+ 4F. Dados expressos em média ±EPM.

MEASUREMENTS OF RENAL FUNCTION THROUGH 12-HOUR CREATININE CLEARANCE;

As shown in Figure 1 and Table 2, we demonstrated that 24 hours after infarction induction, there is a significant reduction in 12-hour creatinine clearance in the 4F-treated groups.

Treatment with 4F restored renal function similar to the Sham group.

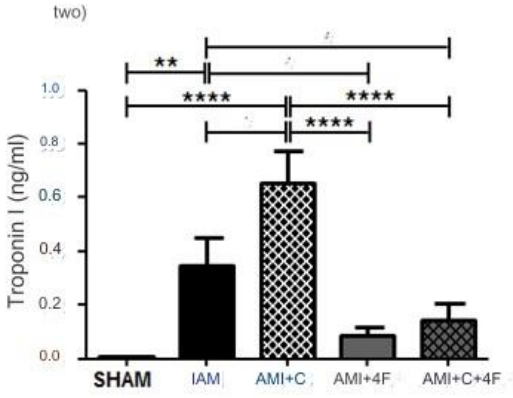
Figure 1. Creatinine clearance 12 hours after induction of AMI and AMI+C. *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001(n=8 animals per group).



MEASUREMENTS OF CARDIAC FUNCTION AND THROUGH PLASMA TROPONIN I TESTING;

As can be seen in Figure 2A and Table 3, there is an increase in the ischemic area marker in the AMI and AMI+C groups. The AMI+4F and AMI+C+4F groups showed a significant reduction in troponin I values.

Figure 2. Plasma troponin I test 24 hours after MIC induction.

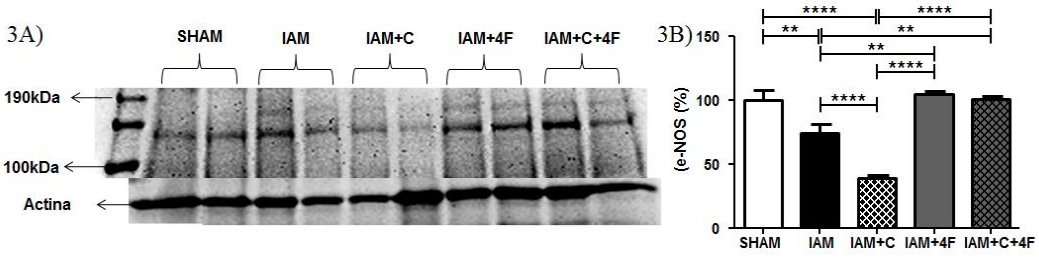


WESTERN BLOTTING STUDY FOR ANALYSIS OF PROTEIN EXPRESSION IN RENAL TISSUE

Study of eNOS expression;

As can be seen in (Figs 3A and 3B) and Table 4, there is a significant decrease in the expression of the eNOS protein. The expression of this protein in infarcted animals (AMI and AMI+C groups) is significantly lower. As in the SHAM group, treatment with the peptide restored eNOS expression in the AMI+4F and AMI+C+4F groups in renal tissue.

Figure 3A and 3B. Expression of eNOS protein in renal tissue. *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001(n=8 animals per group).

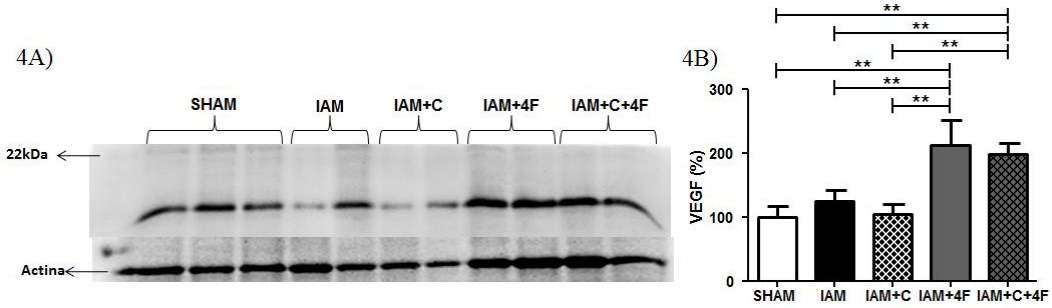


Study of VEGF expression;

As can be seen in (Figs 4A and 4B) and Table 5, there is a significant decrease in the expression of the VEGF protein. The expression of this protein in infarcted animals (AMI and AMI+C groups) was significantly lower, as well as in the SHAM group that did not receive ischemia

stimulation. Treatment with the peptide restored VEGF expression in the AMI+4F and AMI+C+4F groups in renal tissue.

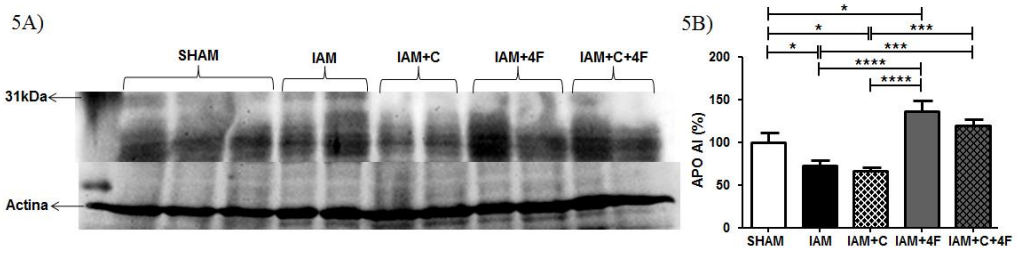
Figure 4A and 4B. Expression of VEGF protein in renal tissue. *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001(n=8 animals per group).



Study of APO AI expression;

As can be seen in (Figs 5A and 5B) and Table 6, there is a significant decrease in the expression of the APO AI protein. The expression of this protein in infarcted animals (AMI and AMI+C groups) is significantly lower, as well as in the SHAM group that did not receive treatment. Treatment with the peptide restored the expression of APO AI in the AMI+4F and AMI+C+4F groups in renal tissue.

Figure 5A and 5B. Expression of APO AI protein in renal tissue. *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001(n=8 animals per group).

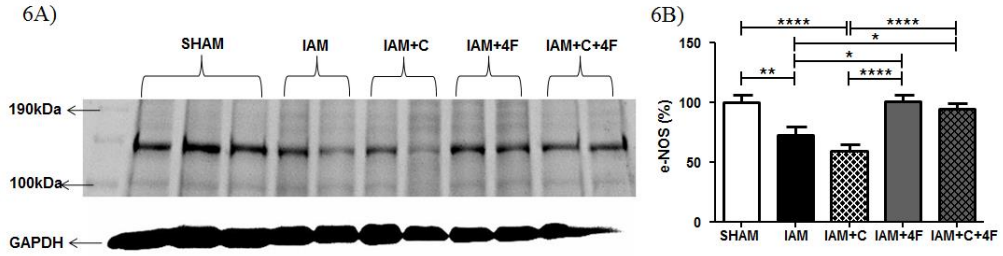


WESTERN BLOTTING STUDY FOR ANALYSIS OF PROTEIN EXPRESSION IN CARDIAC TISSUE;

Study of eNOS expression;

As can be seen in (Figs 6A and 6B) and Table 7, there is a significant decrease in the expression of the eNOS protein. The expression of this protein in infarcted animals (AMI and AMI+C groups) is significantly lower. As in the SHAM group, treatment with the peptide restored eNOS expression in the AMI+4F and AMI+C+4F groups in cardiac tissue.

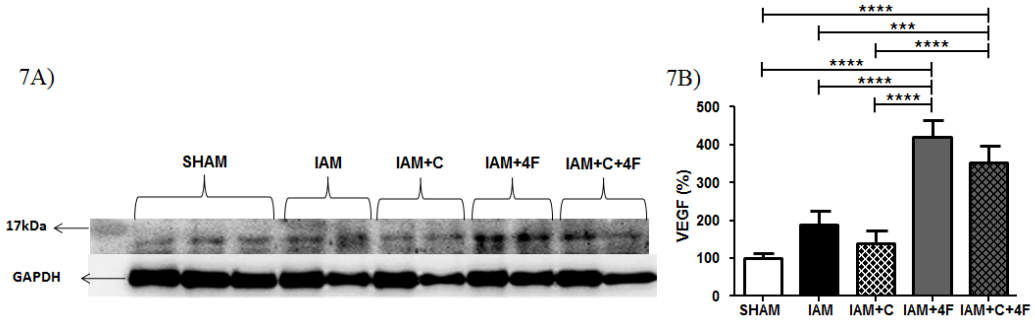
Figure 6A and 6B. Expression of eNOS protein in cardiac tissue. *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001(n=8 animals per group).



Study of VEGF expression;

As can be seen in (Figs 7A and 7B) and Table 8, there is a significant decrease in the expression of the VEGF protein. The expression of this protein in infarcted animals (AMI and AMI+C groups) was significantly lower, as well as in the SHAM group that did not receive ischemia stimulation. Treatment with the peptide restored VEGF expression in the AMI+4F and AMI+C+4F groups in cardiac tissue.

Figure 7A and 7B. Expression of the VEGF protein in cardiac tissue. *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001(n=8 animals per group).

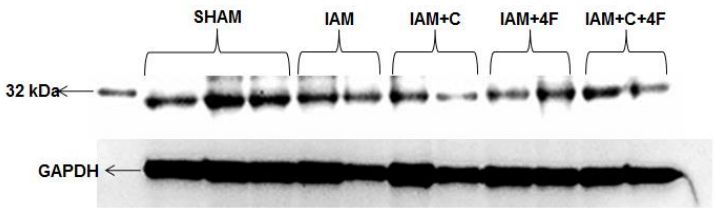


Study of APO AI expression;

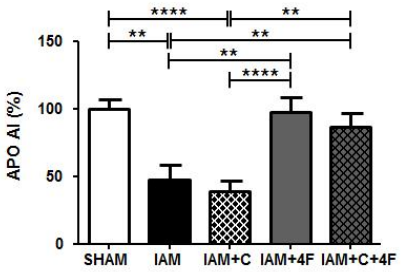
As can be seen in (Figs 8A and 8B) and Table 9, there is a significant decrease in the expression of the APO AI protein. The expression of this protein in infarcted animals (AMI and AMI+C groups) is significantly lower, as well as in the SHAM group that did not receive treatment. Treatment with the peptide restored APO AI expression in the AMI+4F and AMI+C+4F groups in cardiac tissue.

Figure 8A and 8B. Expression of APO AI protein in cardiac tissue. *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001(n=8 animals per group).

8A)



8B)



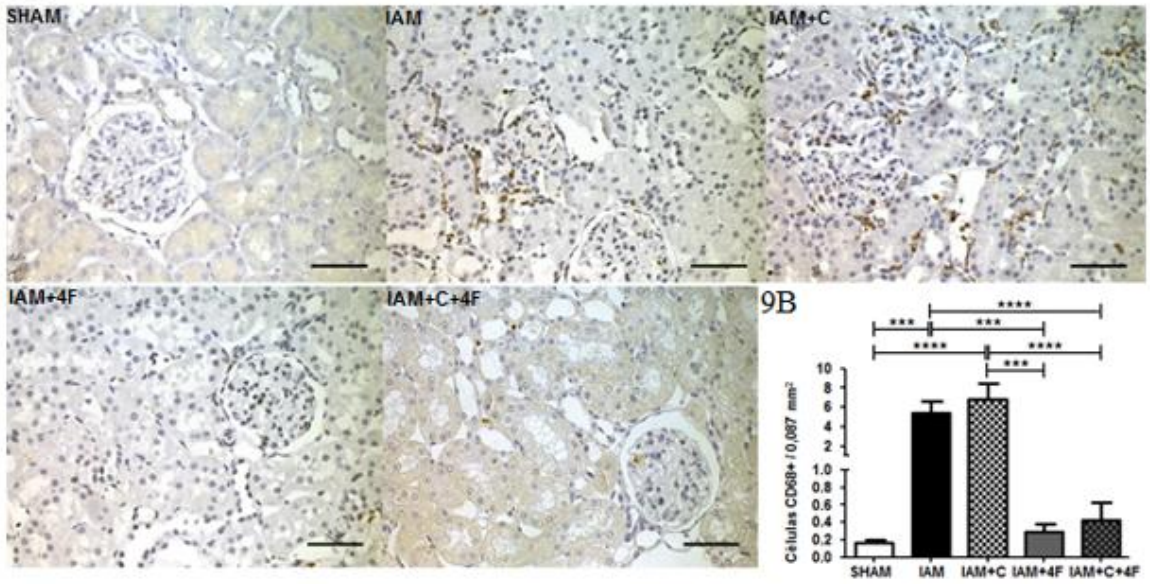
IMMUNOHISTOCHEMISTRY STUDY FOR THE DETERMINATION OF PROTEIN EXPRESSION OF CELLS AND MITOCHONDRIAL MORPHOLOGY IN MYOCARDIAL INFARCTION IN RENAL TISSUE;

Study of the protein expression of CD68-positive cells in renal tissue;

We can observe an increase in macrophages in the AMI and AMI+C groups in the (Fig. 9A, 9B and Table 10) showed a more expressive positive staining score and there was a significant improvement in the AMI+4F and AMI+C+4F groups represented in (Figs 9A, 9B and Table 10) *compared to the SHAM group.*

Figure 9A and 9B. Immunohistochemistry of CD68 expression in renal tissue. *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001(n=6 animals per group).

9A

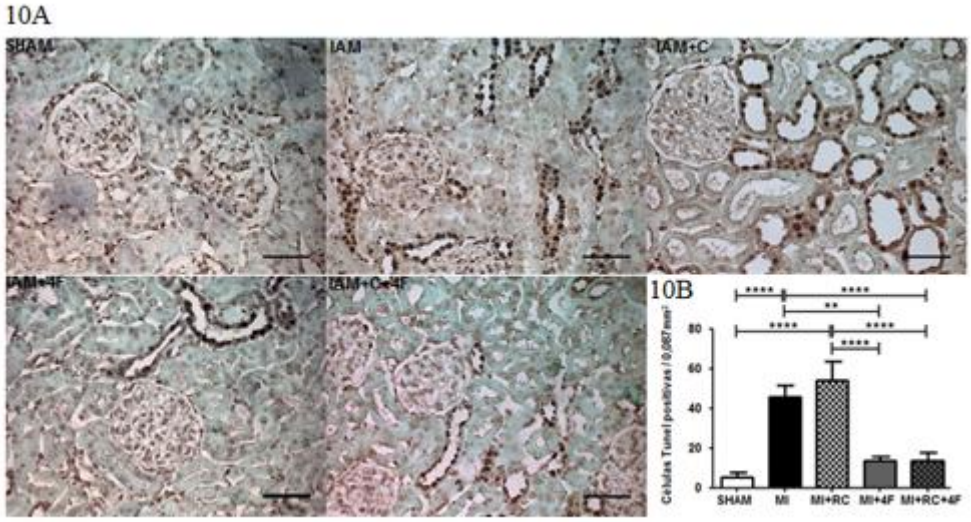


Study of the protein expression of positive Tunel cells in renal tissue;

We can observe an increase in the number of apoptotic cells in the AMI and AMI+C groups in the (Fig. 10A, 10B and Table 11) showed a more expressive positive staining score and there was a

significant improvement in the AMI+4F and AMI+C+4F groups represented in (Figs 10A, 10B and Table 11) *compared to the SHAM group.*

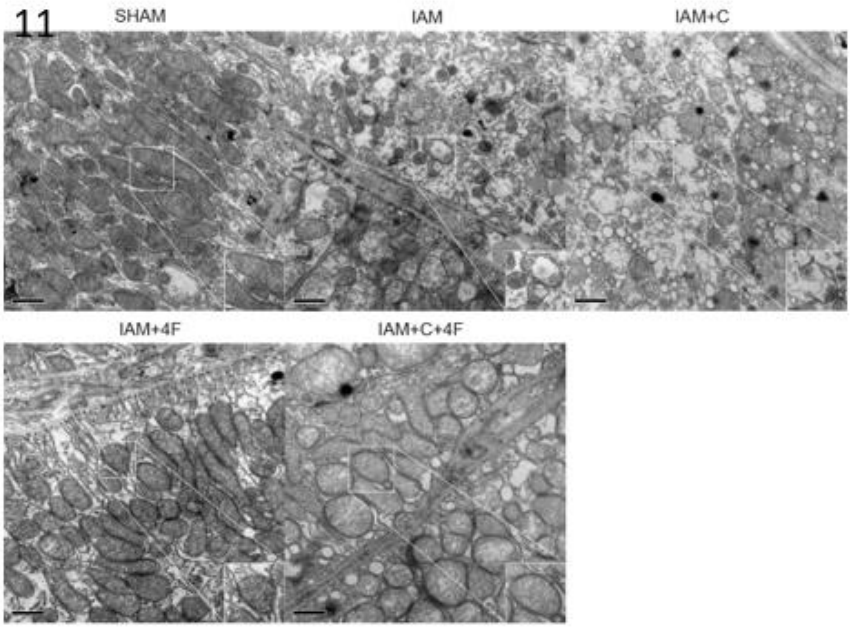
Figure 10A and 10B. Immunohistochemistry of the expression of positive tunnel cells in renal tissue. *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001(n=6 animals per group).



Study of mitochondrial morphology in myocardial infarction in renal tissue;

We can observe morphological changes in the crests of the mitochondria with balloon formations within their structure in the AMI and AMI+C groups in the (Fig. 11) showed a visible alteration in the image. We can associate the same alterations found in the mitochondria of the heart and with the treatment there was an improvement in the alterations in the AMI+4F and AMI+C+4F groups, which had morphological aspects more similar to the SHAM group represented in (Fig. 11).

Figure 11. Mitochondrial morphology in myocardial infarction in renal tissue.

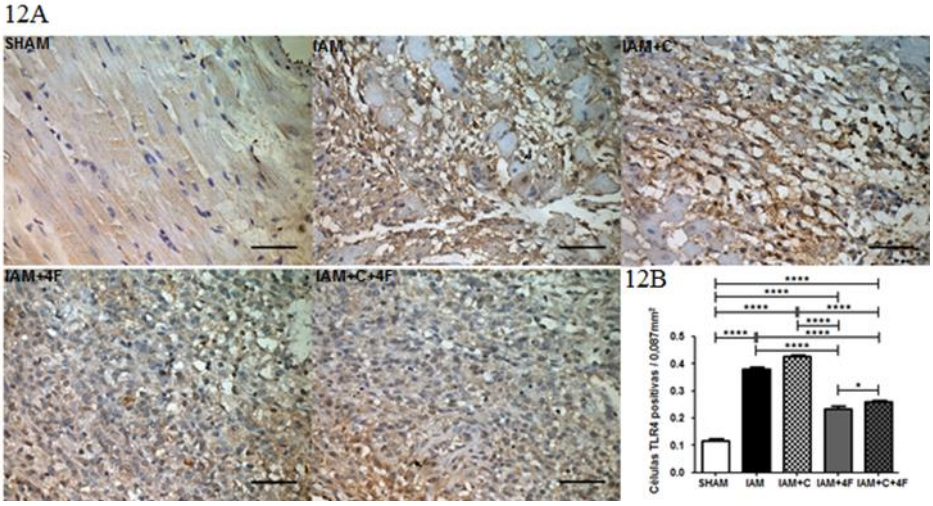


IMMUNOHISTOCHEMISTRY STUDY FOR THE DETERMINATION OF PROTEIN EXPRESSION OF CELLS AND MITOCHONDRIAL MORPHOLOGY IN MYOCARDIAL INFARCTION IN CARDIAC TISSUE;

Study of the protein expression of TLR4 positive cells in cardiac tissue;

We can observe an increase in the number of positive TLR4 cells in the AMI and AMI+C groups in (Figs 12A, 12B and Table 12) showed a more expressive positive staining score and there was a significant improvement in the AMI+4F and AMI+C+4F groups represented in (Figs 12A, 12B and Table 12) *compared to the SHAM group.*

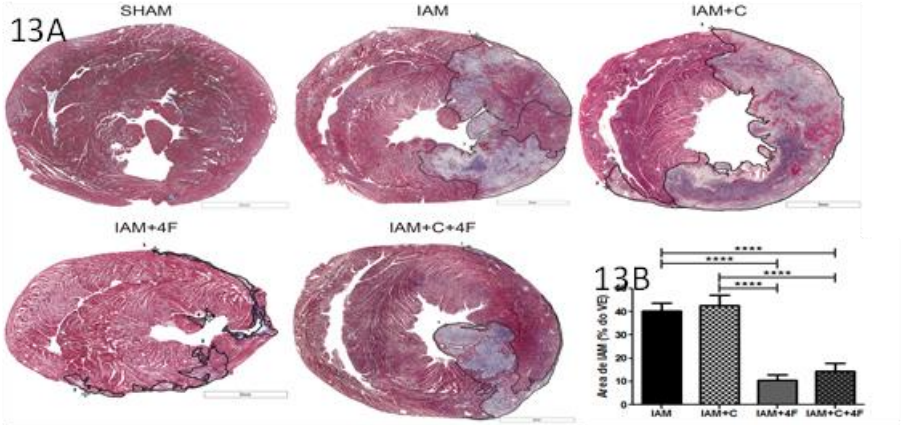
Figure 12A and 12B. Immunohistochemistry of TLR4-positive cell expression in cardiac tissue. *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001(n=6 animals per group).



Study of infarct area expression in cardiac tissue;

Figs 13A, 13B and Table 13 show images of cross-sectional sections of the hearts of the groups studied, at the level of the papillary muscles, as measured by the ratio between the volume of the area marked with Masson's dye and the total volume of the heart. The percentage of infarct area is increased in the AMI and AMI+C groups, and the animals treated with 4F (AMI+4F and AMI+C+4F) showed a significant improvement in the infarct area.

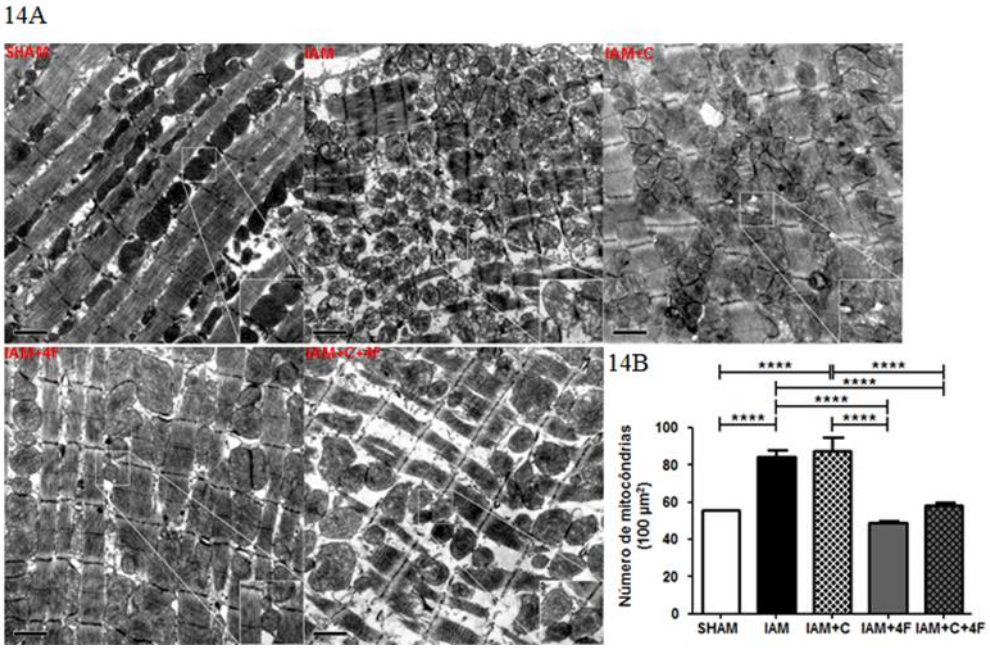
Figure 13A and 13B. Immunohistochemistry of AMI area expression in cardiac tissue. *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001(n=6 animals per group).



Study of mitochondrial morphology and quantification in myocardial infarction in the left ventricular region in rat hearts;

As can be seen in (Fig. 14A, 14B and Table 14), there was an increase in the number of mitochondria identified by the electron microscopy technique in infarcted animals in the AMI and AMI+C groups. There was a significant improvement in the AMI+4F and AMI+C+4F groups represented in (Figs 14A, 14B and Table 14) *compared to the SHAM group.* The result found in our model of cardiac dysfunction corroborates the picture presented so far and reinforces the premise that modifications in mitochondrial structure are associated with an increase in mitochondria in the infarcted area and compromising the proper functioning of the heart pump.

Figure 14A and 14B. Number of mitochondria (100 µm2 mitochondrial area). *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001 (n=6 animals per group).

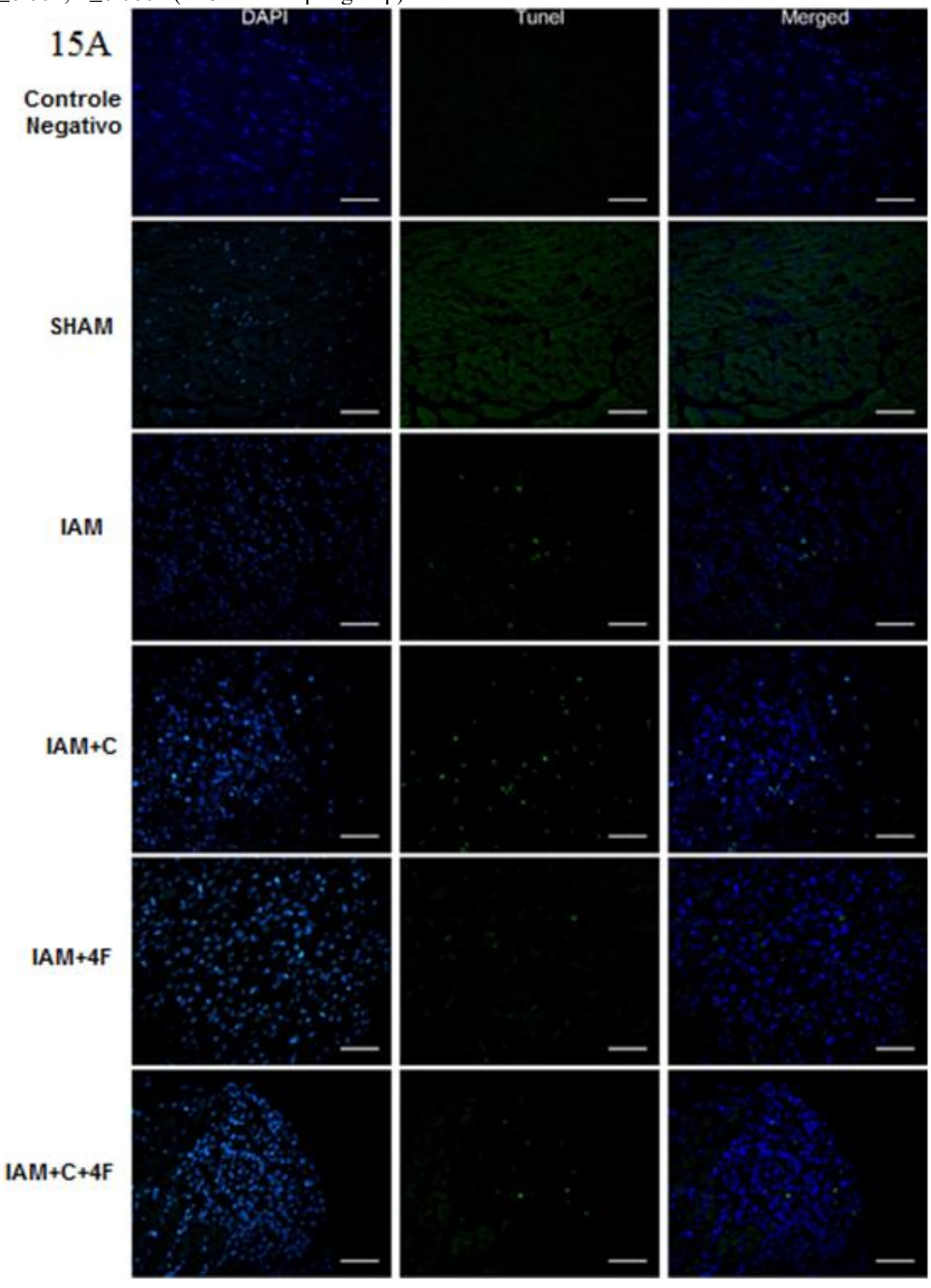


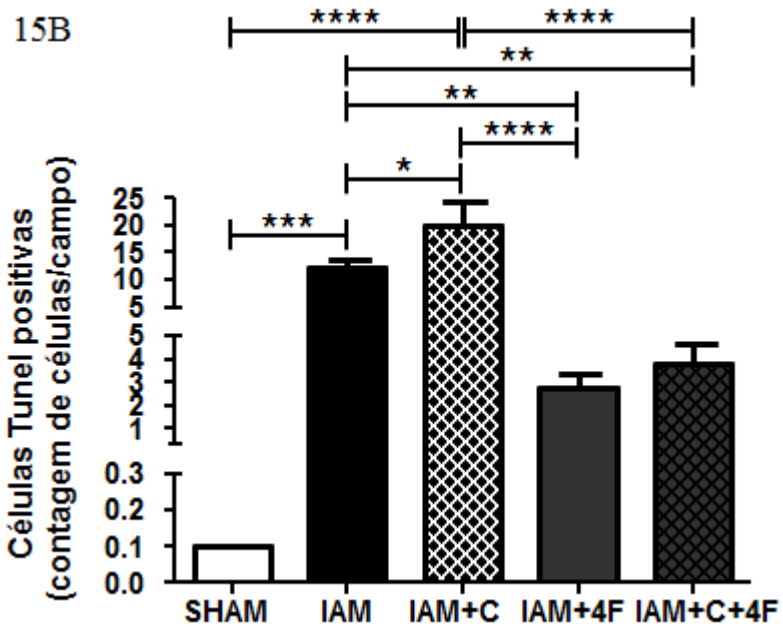
IMMUNOFLUORESCENCE STUDY FOR THE DETERMINATION OF PROTEIN EXPRESSION OF CELLS IN CARDIAC TISSUE

Study of the protein expression of positive Tunnel cells in cardiac tissue;

We can observe an increase in the number of apoptotic cells in the AMI and AMI+C groups in the (Fig. 15A, 15B and Table 15) showed a more expressive positive staining score and there was a significant improvement in the AMI+4F and AMI+C+4F groups represented in (Figs 15A, 15B and Table 15) *compared to the SHAM group.*

Figure 15A and 15B. Immunohistochemistry of the expression of positive tunnel cells in cardiac tissue. *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001 (n=8 animals per group).

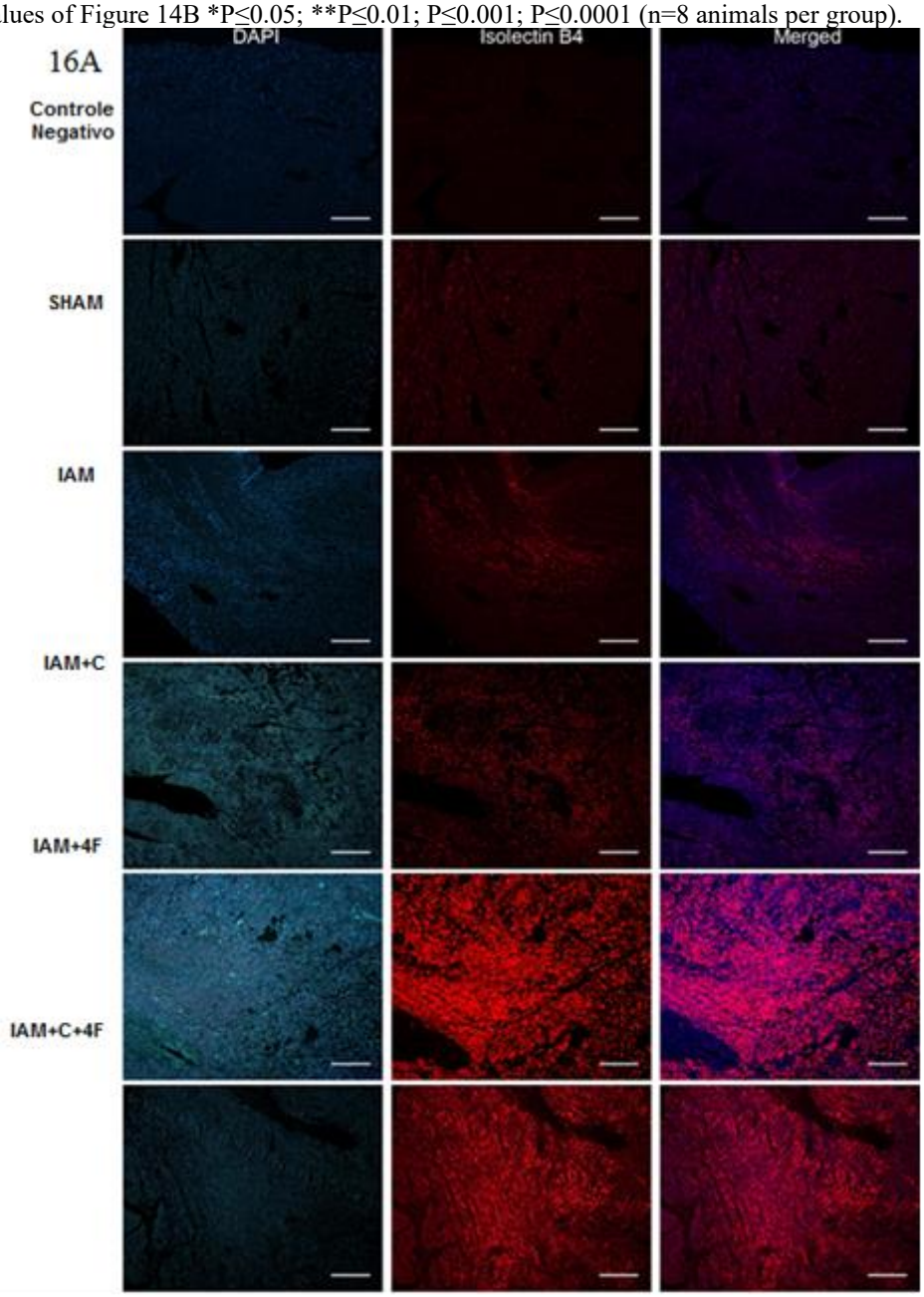


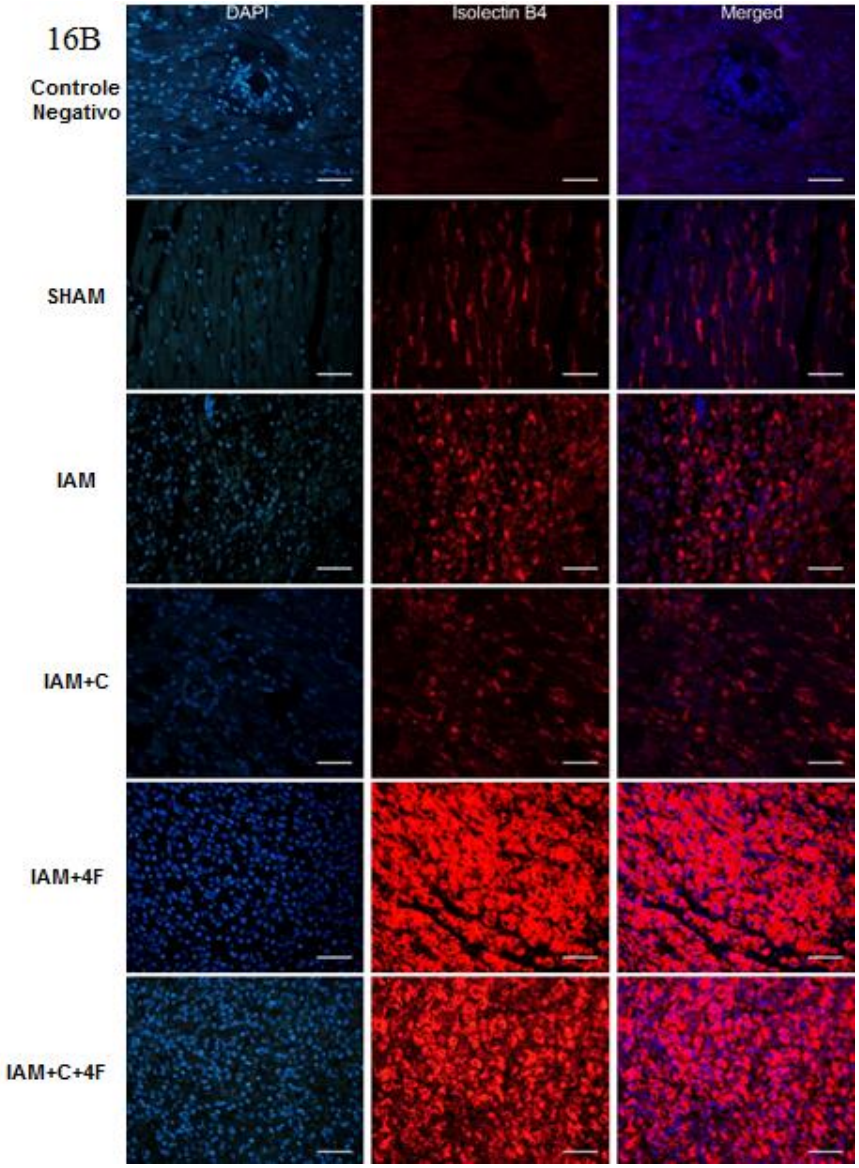


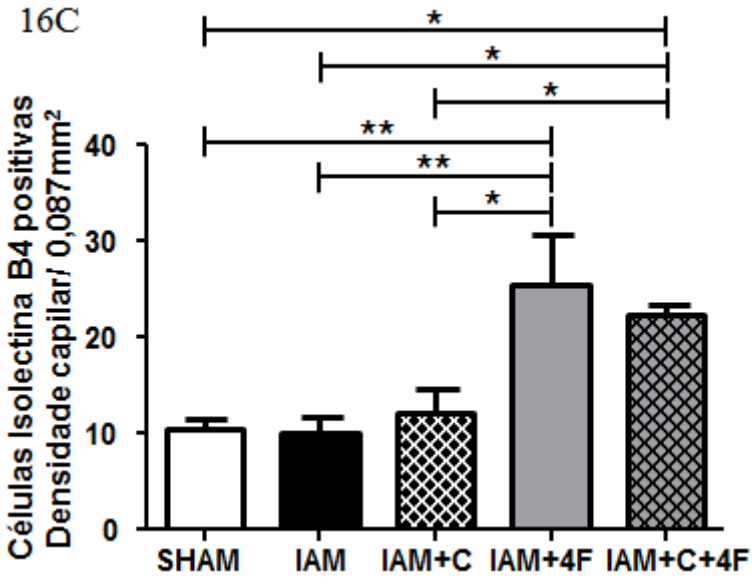
Study of the protein expression of B4-positive isolectin cells in cardiac tissue;

We can observe a decrease in angiogenesis in the AMI and AMI+C groups in the (Fig. 16A, 16B, 16C and Table 16) showed a decrease in the expression of capillary microvascularization, representative through the score with decreased coloration, and there was a significant improvement in the AMI+4F and AMI+C+4F groups represented in (Figs 16A, 16B, 16C and Table 16) *compared to the SHAM group.*

Figure 16A, 16B, and 16C. Immunohistochemistry of the expression of Isolectin B4 positive cells in cardiac tissue. Representative values of Figure 14B *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001 (n=8 animals per group).




16B
DAPI
Isolectin B4
Merged
Controle Negativo
SHAM
IAM
IAM+C
IAM+4F
IAM+C+4F


16C
Células Isolectina B4 positivas
Densidade capilar/ 0,087mm²
0
10
20
30
40
SHAM
IAM
IAM+C
IAM+4F
IAM+C+4F
*
*
*
**
**
*

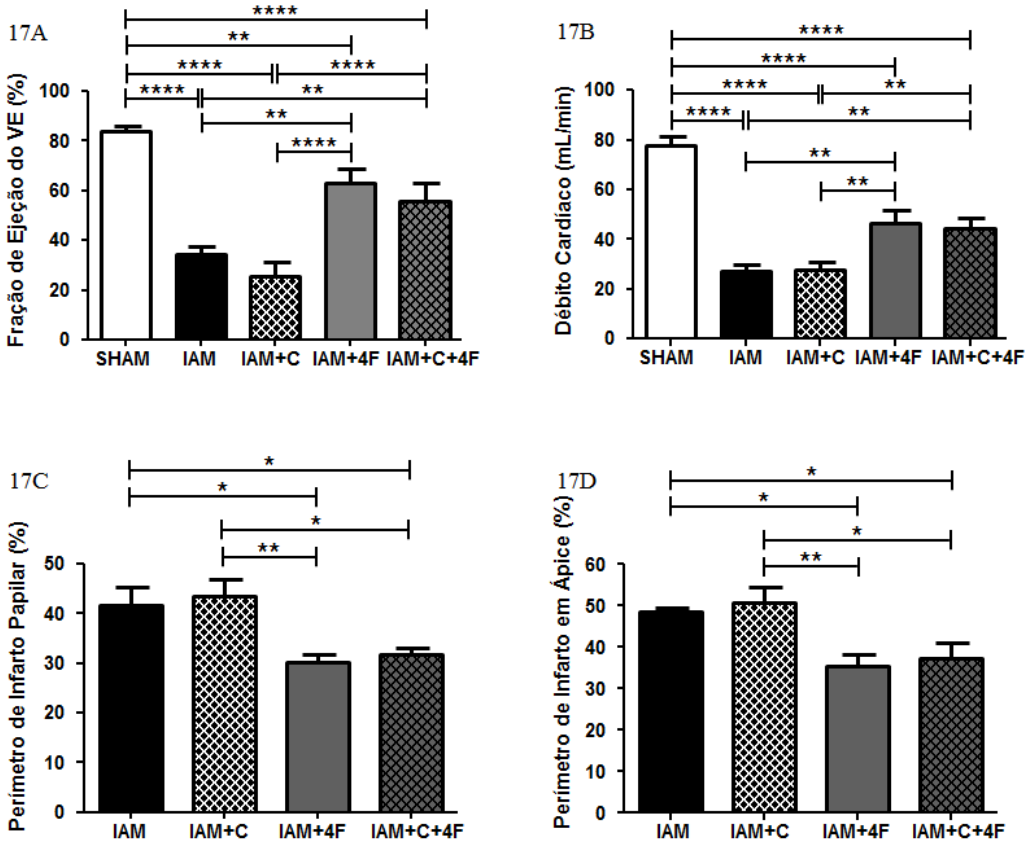
CARDIAC FUNCTION AND HEMODYNAMIC MEASUREMENTS

Measurements of cardiac function and echocardiogram at 24 h after AMI induction;

As can be seen in Figures 17A and 17B, Table 17, there was a significant reduction in ejection fraction and cardiac output in the AMI and AMI+C groups.

As observed in the AMI+4F and AMI+C+4F groups in Figures 17A, 17B and Table 17, the treatment significantly improved ventricular function. The infarct area was measured in the apex and papillary region of the myocardium by echocardiogram in figures 17C, 17D and table 17, showing an improvement in the vascularization of the ischemic area in the AMI+4F and AMI+C+ groups. 4F

Figure 17A, 17B, 17C, and 17D. Echocardiogram 24 hours after AMI induction. *P≤0.05; **P≤0.01; P≤0.001; P≤0.0001(n=8 animals per group).

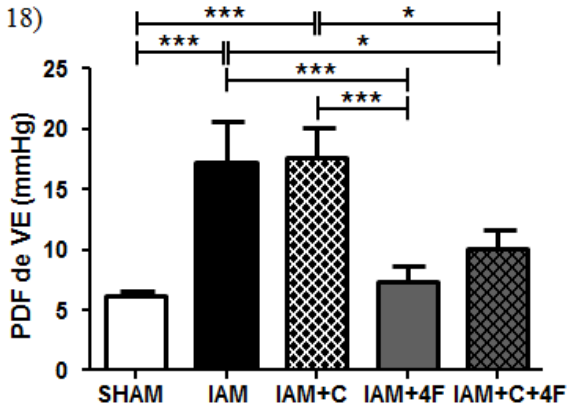


[a] p < 0,0001 vs. Sham; [b] p < 0,0001 vs. IAM+4F; [c] p < 0,0001 vs. IAM+C+4F; [g] p < 0,01 vs. Sham; [h] p < 0,01 vs. IAM+4F; [i] p < 0,01 vs. IAM+C+4F; [k] p < 0,05 vs. IAM+4F; [l] p < 0,05 vs. IAM+C+ 4F. Dados expressos em média ±EPM.

Cardiac function measurements using direct LVPDF measurement at 24 h after AMI induction;

LV DIS was increased in the AMI and AMI+C groups compared to the Sham group. This pressure normalized with treatment in the AMI+4F and AMI+C+4F groups, shown in Figure 18 and Table 18.

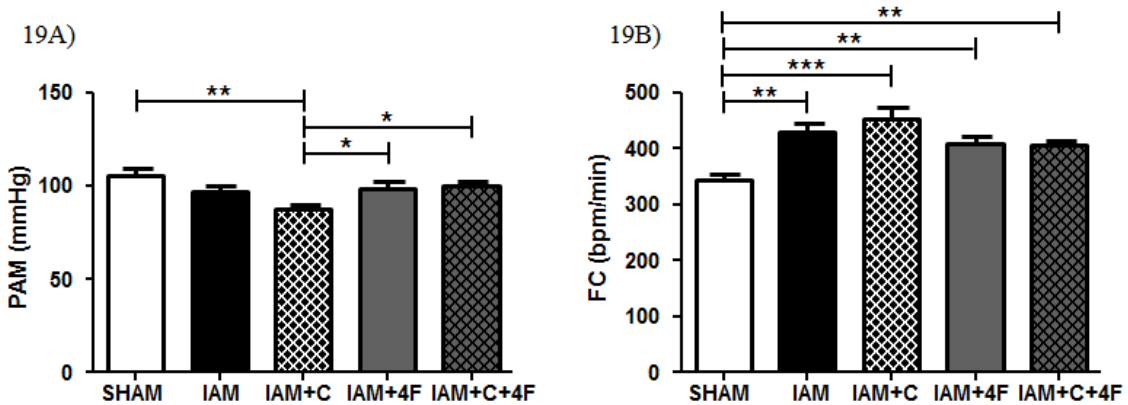
Figure 18. Measurement of LVPD 24 hours after MAI induction. *P≤0.05; **P≤0.01; ***P≤0.001; ****P≤0.0001(n=8 animals per group).



MAP and HR measurements 24 h after AMI induction;

When we compare MAP 24 h after AMI induction in Figure 19A and Table 19, we observed a statistical difference in the AMI+C group, showing a significant decrease in MAP that is already expected in this infarction model, and the AMI group did not show any difference. However, it was recovered in the AMI and AMI+C+4F groups together with the Sham group. However, the AMI, AMI+C groups did not show any difference in comparison with the AMI+4F and AMI+C+4F groups, but there was a statistical difference between the groups without and with treatment compared to the Sham group, showing an increase in HR after AMI induction in Figure 19B and Table 19. Therefore, we found that the AMI+C group showed a decrease in MAP associated with an increase in HR.

Figure 19A and 19B. Hemodynamic evaluation of MAP and HR 24 hours after MAI induction. *P≤0.05; **P≤0.01; ***P≤0.001; ****P≤0.0001(n=8 animals per group).



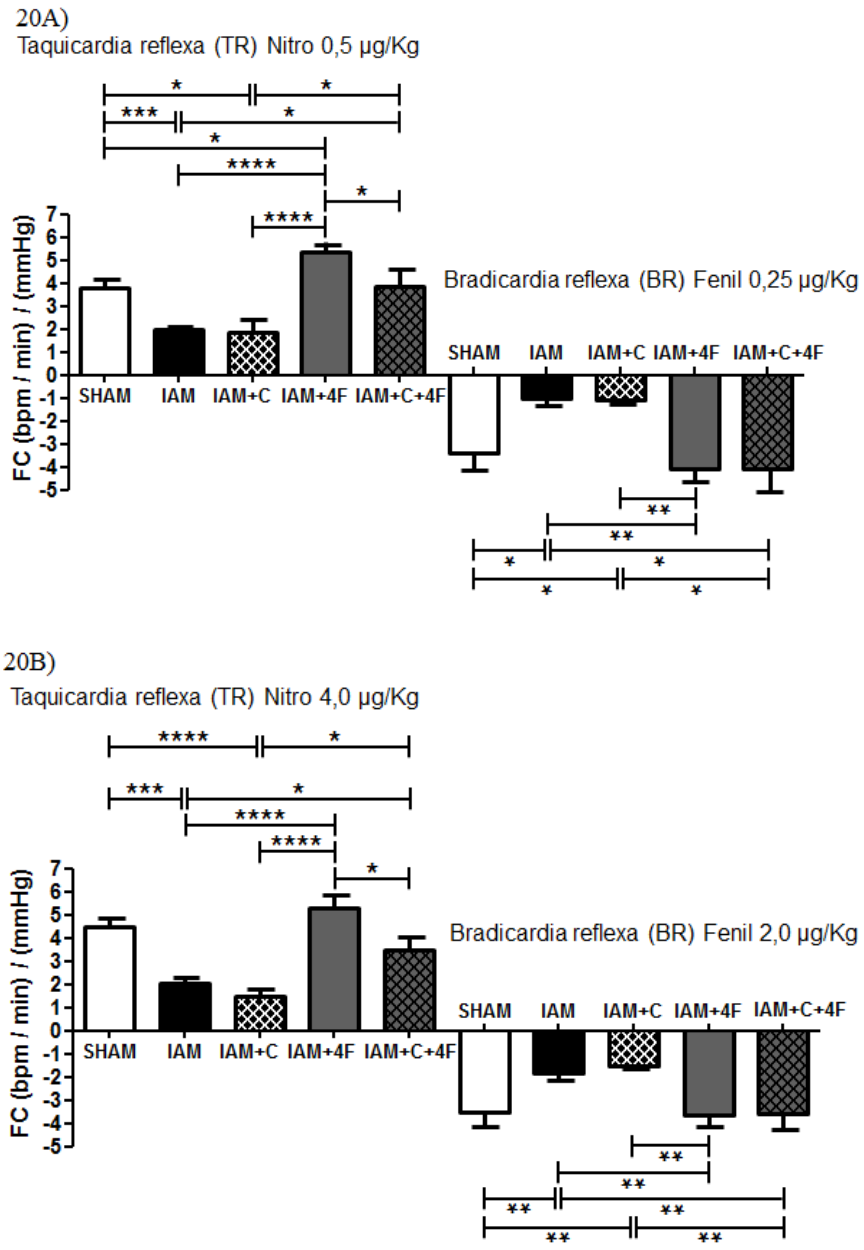
Measures of baroreceptor response 24 h after AMI induction;

In the study of the response of the baroreceptors, we obtained extremely interesting data. Reflex tachycardia induced by nitroprusside, both at low dose 0.5 µg/kg (Fig. 20A) and at high dose

4.0 µg/kg (Fig. 20B), is altered in the AMI and AMI+C groups. Treatment with 4F re-established this baroreceptor response (Fig. 20A, 20B and Table 20).

The same is explained for the study of the response of baroreceptors to a bradycardizing stimulus. Phenylephrine-induced reflex bradycardia at both low 0.25 µg/kg (Fig. 20A) and high dose 2.0 µg/kg (Fig. 20B) is altered in animals with AMI and AMI+C. In animals treated with 4F, this response is recovered (Fig. 20A, 20B and Table 20).

Figures 20A and 20B. Study of the response of baroreceptors 24 hours after MAI induction. *P≤0.05; **P≤0.01; ***P≤0.001; ****P≤0.0001(n=8 animals per group).



DISCUSSION

This is the first study to characterize the effects of apolipoprotein AI on renal and cardiac dysfunction after myocardial infarction in hypercholesterolemic rats receiving contrast.

MODEL OF CARDIAC AND RENAL DYSFUNCTION ASSOCIATED WITH MYOCARDIAL INFARCTION

Knowing that cardiac surgery to induce myocardial infarction in animals is used to mimic the ventricular dysfunction observed in humans, and in order to confirm cardiac dysfunction in the proposed animal model, an initial characterization of the phenotype of animals 24 hours after anterior descending coronary artery ligation surgery was part of this study. To this end, we evaluated cardiac and physiological morphofunctional parameters in the groups studied.[17, 18, 81]

CARDIAC MORPHOFUNCTIONAL CHANGES AND PHYSIOLOGICAL PARAMETERS IN AN ANIMAL MODEL OF CARDIAC DYSFUNCTION ASSOCIATED WITH MYOCARDIAL INFARCTION

Initially, cardiac function and structure were evaluated by means of echocardiographic examination 24 hours after myocardial infarction induction. As observed in the results, 24 hours after coronary artery ligation surgery, the AMI and AMI+C groups showed a reduction ejection fraction, cardiac output, and increased infarct area contributing to ventricular dysfunction. However, there was a significant improvement in the animals treated with 4F, the use of echocardiography in the cardiac morphofunctional evaluation is highly recommended for prognostic purposes and as indicators of ventricular dysfunction progression and its variables are used for the identification of the syndrome in both humans and rodents. [17, 83]

We believe that the left ventricular dysfunction observed in these animals was a consequence of the exacerbated loss of cardiac contractile tissue due to the ischemic process, since after surgery the animals presented an infarcted area of around 40% of the total cardiac area.[18, 84]

In addition to the echocardiographic alterations, the AMI and AMI+C groups showed an increase in the left ventricular (LV) end-diastolic pressure (PDF), which has a significant hemodynamic importance because it is measured within the left ventricular cavity of infarcted animals and records the ventricular filling pressures that determines hemodynamic changes and was reversed with the treatment of 4F in the AMI+4F and AMI+C+4F groups.[85]

We also evaluated troponin I in plasma, which is a gold standard marker of ischemic myocardial injury. The results showed a significant change in the animals infarcted without treatment (AMI and AMI+C) compared to the groups that received the treatment (AMI+4F and AMI+C+4F).

The efficacy of the method was confirmed when compared with the sham group, which did not show changes in plasma levels.[19]

The results suggest that decreased cardiac output is associated with reduced effective arterial volume of organs. Failure of cardiac performance, as seen in animals with heart failure, contributes to worsening survival in infarcted patients.[31] Apolipoprotein AI restored cardiac performance (improving cardiac output, ejection fraction, infarction area, LV PDF, and troponin I).

It is important to report that, associated with these cardiac alterations, we found an increase in the expression of TLR4-positive cells in the heart, as seen by immunohistochemistry, and associated with a decrease in the expression of endothelial synthesa nitric oxide (eNOS) proteins and an increase in lactate in the animals of the AMI and AMI+C groups, signaling an increase in inflammation in the cardiac tissue. The same is observed in other studies with worsening of cardiac function, but the animals treated with AMI+4F and AMI+C+4F showed a significant improvement in this marker.[75, 86-89]

The alterations studied in the heart constitute the basis for a better understanding of the effects resulting from myocardial infarction, since the mitochondria are a fundamental part in the maintenance of the viability and functionality of the cardiomyocyte.

As described in the results, we found changes in the morphology of the organelle, represented by the greater number of mitochondria with decreased muscle fibers in the hearts of AMI and AMI+C animals. There are studies correlating a reduction in the expression of the Parkin protein with mitochondrial autophagy (increase in the amount of mitochondria with reduced area) observed by the electron microscopy technique in infarcted animals.[90, 91]

The results corroborate and indicate that impairments in mitochondrial function cannot be compensated by the increase in the number of mitochondria, and that an appropriate balance in the structure of the organelle is necessary for the maintenance of cardiac homeostasis in infarcted rats.

Energy production in heart tissue is not only related to mitochondrial morphology, but is also involved in the structural organization of organelles, represented by density and location. Due to the continuous energy demand generated by ATP, adult cardiomyocytes have extremely dense mitochondria when compared to other tissues, since in addition to effectively participating in the synthesis of ATP via oxidative phosphorylation, the organelle also participates in Ca2+ signaling, cell proliferation and apoptosis.[92-94]

When we investigated the apoptosis pathway through the expression of positive tunnel by immunofluorescence in the cardiac tissue, we observed an increase in the AMI and AMI+C groups, which is associated with the increase of VEGF protein by western blot and decrease in angiogenesis represented by the expression of B4 isalectin in cardiac tissue in immunofluorescence. However, the

groups that received 4F treatment (AMI+4F and AMI+C+4F) showed significant improvement in all these markers of apoptosis in the cardiac tissue.[95-98]

Taken together, our data demonstrate an important contribution of cardiac function attributed to the treatment of 4F that was confirmed by the significant increase in the expression of apolipoprotein AI in the cardiac tissue of the AMI+4F and AMI+C+4F groups by western blot. Our lipid profile data report a significant difference in the increase in HDL, decrease in LDL, decrease in VLDL and plasma triglycerides of the treated animals when compared with the AMI, AMI+C groups.[46, 66, 74, 99]

RENAL ALTERATIONS AND PHYSIOLOGICAL PARAMETERS IN AN ANIMAL MODEL OF CARDIAC DYSFUNCTION ASSOCIATED WITH MYOCARDIAL INFARCTION

In this study, a significant reduction in glomerular filtration measured by creatinine clearance associated with reduced urine flow was observed in the AMI and AMI+C groups, which was completely reversed in the AMI+4F and AMI+C+4F groups that received the treatment. However, the groups treated even with a significant increase in urinary flow did not show significant differences in sodium excretion fractions, potassium excretion fractions and urinary osmolality 24 hours after infarction induction.[8]

It is important to emphasize that associated with the decrease in glomerular filtration, there were some renal structural alterations, such as: increase in CD68 positive cells by immunohistochemistry associated with decreased expression of eNOS protein by western blot and increase in plasma lactate as was reported in cardiac alterations. We can affirm that there was a cross-tok between the heart and the renal system through an inflammatory interaction that was demonstrated by significant alterations in the AMI and AMI+C groups when compared to the SHAM, AMI+4F and AMI+C+4F groups.[72, 100]

In addition, there is also an important protein impairment related to the vascular integrity of the endothelium, which could explain the endothelial dysfunction occurring after ischemia and being considered as a consequence of impaired NO release (which is also observed in infarction patients). Our hypothesis is based on the alteration of the protein responsible for endothelial integrity (e-NOS). All of these events would be associated with a decrease in apo AI in renal tissue.[101]

We believe that the findings of renal alterations are also related to inflammation, oxidative stress, cell proliferation and apoptosis similar to cardiac abnormalities. Our results demonstrate a significant increase in the expression of positive tunnel cells by immunohistochemistry, increased expression of VEGF protein by western blot and associated with morphological changes of mitochondria that are related to cell death by apoptosis in the AMI and AMI+C groups. These results may contribute to a better understanding of acute kidney injury in cardiac events.[102-106]

The results of the present study show that the treatment with 4F was positive in the renal tissue, showing a significant increase in the expression of apolipoprotein AI in the AMI+4F and AMI+C+4F groups compared to the animals in the SHAM, AMI and AMI+C groups. Improving or Cardiac performance and renal function in contrast-infarcted rats. [46, 66, 74, 99]

HEMODYNAMIC CHANGES IN THE ANIMAL MODEL OF CARDIAC DYSFUNCTION ASSOCIATED WITH MYOCARDIAL INFARCTION

The response of the baroreceptors is also altered. There was an alteration in MAP in animals with AMI+C associated with an increase in HR in relation to sham and treated animals. However, the AMI group did not show significant changes. Studies have shown that these changes in baroreceptor response are associated with increased morbidity.[107]

Reduced HDL is correlated with impaired cardiac function in patients with systemic inflammatory response syndrome.[74, 108]. In our study, animals with AMI and AMI+C, the LDL was significantly increased. Nature pro-inflammatory LDL has been attributed to the cytotoxic release and lipid peroxidation.[46] Oxidized LDL alters the endothelium and leads to its dysfunction. Recently, they have shown that peptide 4F prevents lipid peroxidation.[46] Data suggest that it induces the formation of new HDL particles that are enriched in paraoxonase, an enzyme that degrades lipid peroxides.4F[69]

Administration of peptide 4F increases paraoxonase activity, decreases cytokine synthesis and release, and decreases oxidative stress. [69, 109]

In a recent study, it was shown that the HDL in the normal range appears to be completely protective against klotho protein dysfunction.[110] With aging, plasma HDL concentrations decrease.[110] Decreased serum HDL concentration and function may occur secondary to hormonal changes, inflammatory processes, and diabetes mellitus.[110, 111] HDL deficiency is extremely rare among centenarians. HDL can modulate the aging process, not only because of its well-known activity antiatherogenic, but possibly also by directly interfering with aging by signaling the klotho protein. Most of the current results, however, are based on cell culture. There is no confirmation yet *in vivo*.[58]

In an extremely aggressive disease such as infarction, treatment with 4F peptide can be a great therapeutic option.[76]

The baroreflex system is responsible for maintaining cardiovascular homeostasis and preserving blood flow to vital organs.[112] It is known that in infarction, there is a direct relationship between baroreceptor sensitivity and survival, which is diminished when there is dysfunction of the baroreflex response.[107]. It has been described that eNOS activity is decreased in endothelial cells when exposed to LDL.[113] It is also described that oxidized LDL can alter the expression of

eNOS.[114] Alterations in HR and MAP variability, determined in part by nitric oxide-dependent endothelial dysfunction, are related to an adverse prognosis in cardiovascular diseases. Pelet et al. demonstrated that rosuvastatin decreases the expression of caveolin-1 (an eNOS inhibitor) and promotes improved eNOS function in dyslipidemic mice *knockouts* for apo E, with improvement in HR and MAP variability in these animals.[115] We demonstrated a dysfunction of the baroreceptor system in animals with AMI and AMI+C. Further studies will need to be done to identify whether the improvement in baroreflex sensitivity in animals treated with apolipoprotein AI is due to an increase in eNOS expression. In addition, this improvement may also be due to increased serum HDL levels and decreased serum LDL levels.

The mortality of patients with cardiovascular disease associated with acute kidney injury affects a large part of the population.[8]

In our study, there was normalization of renal function (measured by creatinine clearance) with treatment with apolipoprotein AI.

Therefore, treatment with Apo AI 4F, leads to anti-inflammatory effects, improves heart and kidney function. We also demonstrated that, in this infarction model, there is a dysfunction of the baroreflex response. The treatment, associated with an increase in HDL levels, probably led to a protection of the endothelium. This endothelial protection can be interpreted by the best expression of eNOS.

CONCLUSION

Our results demonstrate that the use of contrast in hypercholesterolemic animals with AMI greatly contributes to the worsening of cardiac and renal dysfunction.

And based on the results, we can affirm that 4F, through an HDL-dependent pathway, currently used as a therapeutic strategy in the treatment of cardiovascular diseases, is capable of reversing the changes in the cardiac and renal function of infarcted animals. Thus, we conclude that 4F plays an important role in protection, with beneficial effects on the maintenance of endothelial integrity, improvement of myocardial contractile function and renal system. Therefore, finding the most effective way to treat 4F in cardiovascular and renal diseases represents an important step for the future of research in the treatment of cardiorenal syndrome.

REFERENCES

1. PAHO/WHO. (2016). Disponível em: <http://www.paho.org/hq/>

2. Mozaffarian, D., Benjamin, E. J., Go, A. S., Arnett, D. K., Blaha, M. J., Cushman, M., et al. (2016). Executive Summary: Heart Disease and Stroke Statistics--2016 Update: A Report From the American Heart Association. Circulation, 133(4), 447-454.

3. Sood, V., & Chakravarti, R. N. (1976). Systemic stress in the production of cardiac thrombosis in hypercholesterolaemic rats. Res Exp Med (Berl), 167(1), 31-45.

4. Ma, X., & Feng, Y. (2016). Hypercholesterolemia Tunes Hematopoietic Stem/Progenitor Cells for Inflammation and Atherosclerosis. Int J Mol Sci, 17(7).

5. Stokes, K. Y., Calahan, L., Hamric, C. M., Russell, J. M., & Granger, D. N. (2009). CD40/CD40L contributes to hypercholesterolemia-induced microvascular inflammation. Am J Physiol Heart Circ Physiol, 296(3), H689-H697.

6. Lou-Bonafonte, J. M., Arnal, C., Navarro, M. A., & Osada, J. (2012). Efficacy of bioactive compounds from extra virgin olive oil to modulate atherosclerosis development. Mol Nutr Food Res, 56(7), 1043-1057.

7. Sherman, C. B., Peterson, S. J., & Frishman, W. H. (2010). Apolipoprotein A-I mimetic peptides: a potential new therapy for the prevention of atherosclerosis. Cardiol Rev, 18(3), 141-147.

8. Vaziri, N. D., Bai, Y., Yuan, J., Said, H. L., Sigala, W., & Ni, Z. (2010). ApoA-1 mimetic peptide reverses uremia-induced upregulation of pro-atherogenic pathways in the aorta. Am J Nephrol, 32(3), 201-211.

9. Maczewski, M., & Maczewska, J. (2006). Hypercholesterolemia exacerbates ventricular remodeling in the rat model of myocardial infarction. J Card Fail, 12(5), 399-405.

10. Maczewski, M., Maczewska, J., & Duda, M. (2008). Hypercholesterolaemia exacerbates ventricular remodelling after myocardial infarction in the rat: role of angiotensin II type 1 receptors. Br J Pharmacol, 154(8), 1640-1648.

11. Weissberg, P. L. (2000). Atherogenesis: current understanding of the causes of atheroma. Heart, 83(2), 247-252.

12. Wu, N., Zhang, X., Jia, P., & Jia, D. (2015). Hypercholesterolemia aggravates myocardial ischemia reperfusion injury via activating endoplasmic reticulum stress-mediated apoptosis. Exp Mol Pathol, 99(3), 449-454.

13. Lu, S., Du, P., Shan, C., Wang, Y., Ma, C., & Dong, J. (2016). Haploinsufficiency of Hand1 improves mice survival after acute myocardial infarction through preventing cardiac rupture. Biochem Biophys Res Commun.

14. Chae, C. U., Albert, C. M., Moorthy, M. V., Lee, I. M., & Buring, J. E. (2012). Vitamin E supplementation and the risk of heart failure in women. Circ Heart Fail, 5(2), 176-182.

15. Rodrigues, B., Mostarda, C. T., Jorge, L., Barboza, C. A., Grans, C. F., De Angelis, K., et al. (2013). Impact of myocardial infarction on cardiac autonomic function in diabetic rats. J Diabetes Complications, 27(1), 16-22.

16. Rabald, S., Hagendorff, A., Pfeiffer, D., Zimmer, H. G., & Deten, A. (2007). Contrast enhanced echocardiographic follow-up of cardiac remodeling and function after myocardial infarction in rats. Ultrasound Med Biol, 33(10), 1561-1571.

17. Morgan, E. E., Faulx, M. D., McElfresh, T. A., Kung, T. A., Zawaneh, M. S., Stanley, W. C., et al. (2004). Validation of echocardiographic methods for assessing left ventricular dysfunction in rats with myocardial infarction. Am J Physiol Heart Circ Physiol, 287(5), H2049-H2053.

18. Sjaastad, I., Sejersted, O. M., Ilebekk, A., & Bjornerheim, R. (2000). Echocardiographic criteria for detection of postinfarction congestive heart failure in rats. J Appl Physiol (1985), 89(4), 1445-1454.

19. Frobert, A., Valentin, J., Magnin, J. L., Riedo, E., Cook, S., & Giraud, M. N. (2015). Prognostic Value of Troponin I for Infarct Size to Improve Preclinical Myocardial Infarction Small Animal Models. Front Physiol, 6, 353.

20. Gu, S. S., Shi, N., & Wu, M. P. (2007). The protective effect of ApolipoproteinA-I on myocardial ischemia-reperfusion injury in rats. Life Sci, 81(9), 702-709.

21. Rodrigues, F., Feriani, D. J., Barboza, C. A., Abssamra, M. E., Rocha, L. Y., Carrozi, N. M., et al. (2014). Cardioprotection afforded by exercise training prior to myocardial infarction is associated with autonomic function improvement. BMC Cardiovasc Disord, 14, 84.

22. Penumathsa, S. V., Thirunavukkarasu, M., Koneru, S., Juhasz, B., Zhan, L., Pant, R., et al. (2007). Statin and resveratrol in combination induces cardioprotection against myocardial infarction in hypercholesterolemic rat. J Mol Cell Cardiol, 42(3), 508-516.

23. Yang, J., Guo, X., Ding, J. W., Li, S., Yang, R., Fan, Z. X., et al. (2015). RP105 Protects Against Apoptosis in Ischemia/Reperfusion-Induced Myocardial Damage in Rats by Suppressing TLR4-Mediated Signaling Pathways. Cell Physiol Biochem, 36(6), 2137-2148.

24. Aspelin, P., Aubry, P., Fransson, S. G., Strasser, R., Willenbrock, R., Berg, K. J., et al. (2003). Nephrotoxic effects in high-risk patients undergoing angiography. N Engl J Med, 348(6), 491-499.

25. Bakris, G. L., Lass, N., Gaber, A. O., Jones, J. D., & Burnett, J. C. (1990). Radiocontrast medium-induced declines in renal function: a role for oxygen free radicals. Am J Physiol, 258(1 Pt 2), F115-F120.

26. Barrett, B. J. (1994). Contrast nephrotoxicity. J Am Soc Nephrol, 5(2), 125-137.

27. Andrade, L., Campos, S. B., & Seguro, A. C. (1998). Hypercholesterolemia aggravates radiocontrast nephrotoxicity: protective role of L-arginine. Kidney Int, 53(6), 1736-1742.

28. Campos, S. B., Ori, M., Dórea, E. L., & Seguro, A. C. (1999). Protective effect of L-arginine on hypercholesterolemia-enhanced renal ischemic injury. Atherosclerosis, 143(2), 327-334.

29. Bird, J. E., Giancarli, M. R., Megill, J. R., & Durham, S. K. (1996). Effects of endothelin in radiocontrast-induced nephropathy in rats are mediated through endothelin-A receptors. J Am Soc Nephrol, 7(8), 1153-1157.

30. He, X., Li, L., Tan, H., Chen, J., & Zhou, Y. (2016). Atorvastatin attenuates contrast-induced nephropathy by modulating inflammatory responses through the regulation of JNK/p38/Hsp27 expression. J Pharmacol Sci, 131(1), 18-27.

31. Gleeson, T. G., & Bulugahapitiya, S. (2004). Contrast-induced nephropathy. AJR Am J Roentgenol, 183(6), 1673-1689.

32. Taliercio, C. P., Vlietstra, R. E., Fisher, L. D., & Burnett, J. C. (1986). Risks for renal dysfunction with cardiac angiography. Ann Intern Med, 104(4), 501-504.

33. Calzavacca, P., Ishikawa, K., Bailey, M., May, C. N., & Bellomo, R. (2014). Systemic and renal hemodynamic effects of intra-arterial radiocontrast. Intensive Care Med Exp, 2(1), 32.

34. Gibson, C. M., Pinto, D. S., Murphy, S. A., Morrow, D. A., Hobbach, H. P., Wiviott, S. D., et al. (2003). Association of creatinine and creatinine clearance on presentation in acute myocardial infarction with subsequent mortality. J Am Coll Cardiol, 42(9), 1535-1543.

35. Wodzig, K. W., Kragten, J. A., Hermens, W. T., Glatz, J. F., & van Dieijen-Visser, M. P. (1997). Estimation of myocardial infarct size from plasma myoglobin or fatty acid-binding protein. Influence of renal function. Eur J Clin Chem Clin Biochem, 35(3), 191-198.

36. Cruz, D. N., Goh, C. Y., Palazzuoli, A., Slavin, L., Calabrò, A., Ronco, C., et al. (2011). Laboratory parameters of cardiac and kidney dysfunction in cardio-renal syndromes. Heart Fail Rev, 16(6), 545-551.

37. Chevalier, R. L. (2016). The proximal tubule is the primary target of injury and progression of kidney disease: role of the glomerulotubular junction. Am J Physiol Renal Physiol, 311(1), F145-F161.

38. Gandhi, S., Mosleh, W., Abdel-Qadir, H., & Farkouh, M. E. (2014). Statins and contrast-induced acute kidney injury with coronary angiography. Am J Med, 127(10), 987-1000.

39. Ledvényiová-Farkašová, V., Bernátová, I., Balis, P., Puzserova, A., Barteková, M., Gablovsky, I., et al. (2015). Effect of crowding stress on tolerance to ischemia-reperfusion injury in young male and female hypertensive rats: molecular mechanisms. Can J Physiol Pharmacol, 93(9), 793-802.

40. Nishizawa, M., Kumagai, H., Ichikawa, M., Oshima, N., Suzuki, H., & Saruta, T. (1997). Improvement in baroreflex function by an oral angiotensin receptor antagonist in rats with myocardial infarction. Hypertension, 29(1 Pt 2), 458-463.

41. Heringer-Walther, S., Batista, E. N., Walther, T., Khosla, M. C., Santos, R. A., & Campagnole-Santos, M. J. (2001). Baroreflex improvement in SHR after ACE inhibition involves angiotensin-(1-7). Hypertension, 37(5), 1309-1314.

42. Fan, W., Reynolds, P. J., & Andresen, M. C. (1996). Baroreflex frequency-response characteristics to aortic depressor and carotid sinus nerve stimulation in rats. Am J Physiol, 271(6 Pt 2), H2218-H2227.

43. Tao, X., Zhang, S. H., Chu, Z. X., & Su, D. F. (2003). Apoptosis is involved in the cardiac damage induced by sinoaortic denervation in rats. Clin Exp Pharmacol Physiol, 30(5-6), 362-368.

44. Stein, R. D., Backman, S. B., Collier, B., & Polosa, C. (1997). Bradycardia produced by pyridostigmine and physostigmine. Can J Anaesth, 44(12), 1286-1292.

45. Rosenson, R. S., Brewer, H. B., Ansell, B. J., Barter, P., Chapman, M. J., Heinecke, J. W., et al. (2016). Dysfunctional HDL and atherosclerotic cardiovascular disease. Nat Rev Cardiol, 13(1), 48-60.

46. Van Lenten, B. J., Hama, S. Y., de Beer, F. C., Stafforini, D. M., McIntyre, T. M., Prescott, S. M., et al. (1995). Anti-inflammatory HDL becomes pro-inflammatory during the acute phase response. Loss of protective effect of HDL against LDL oxidation in aortic wall cell cocultures. J Clin Invest, 96(6), 2758-2767.

47. Chapman, M. J., Assmann, G., Fruchart, J. C., Shepherd, J., Sirtori, C., & HDL-C ECPo. (2004). Raising high-density lipoprotein cholesterol with reduction of cardiovascular risk: the role of nicotinic acid--a position paper developed by the European Consensus Panel on HDL-C. Curr Med Res Opin, 20(8), 1253-1268.

48. Assmann, G., & Nofer, J. R. (2003). Atheroprotective effects of high-density lipoproteins. Annu Rev Med, 54, 321-341.

49. Brown, M. S., & Goldstein, J. L. (1984). How LDL receptors influence cholesterol and atherosclerosis. Sci Am, 251(5), 58-66.

50. Arora, S., Patra, S. K., & Saini, R. (2016). HDL-A molecule with a multi-faceted role in coronary artery disease. Clin Chim Acta, 452, 66-81.

51. Shih, A. Y., Sligar, S. G., & Schulten, K. (2009). Maturation of high-density lipoproteins. J R Soc Interface, 6(39), 863-871.

52. Datta, G., Chaddha, M., Hama, S., Navab, M., Fogelman, A. M., Garber, D. W., et al. (2001). Effects of increasing hydrophobicity on the physical-chemical and biological properties of a class A amphipathic helical peptide. J Lipid Res, 42(7), 1096-1104.

53. Nagao, K., Hata, M., Tanaka, K., Takechi, Y., Nguyen, D., Dhanasekaran, P., et al. (2014). The roles of C-terminal helices of human apolipoprotein A-I in formation of high-density lipoprotein particles. Biochim Biophys Acta, 1841(1), 80-87.

54. Vedhachalam, C., Chetty, P. S., Nickel, M., Dhanasekaran, P., Lund-Katz, S., Rothblat, G. H., et al. (2010). Influence of apolipoprotein (Apo) A-I structure on nascent high density lipoprotein (HDL) particle size distribution. J Biol Chem, 285(42), 31965-31973.

55. Navab, M., Anantharamaiah, G. M., Reddy, S. T., Hama, S., Hough, G., Grijalva, V. R., et al. (2005). Apolipoprotein A-I mimetic peptides. Arterioscler Thromb Vasc Biol, 25(7), 1325-1331.

56. Van Lenten, B. J., Wagner, A. C., Jung, C. L., Ruchala, P., Waring, A. J., Lehrer, R. I., et al. (2008). Anti-inflammatory apoA-I-mimetic peptides bind oxidized lipids with much higher affinity than human apoA-I. J Lipid Res, 49(11), 2302-2311.

57. Epand, R. M., Epand, R. F., Sayer, B. G., Datta, G., Chaddha, M., & Anantharamaiah, G. M. (2004). Two homologous apolipoprotein AI mimetic peptides. Relationship between membrane interactions and biological activity. J Biol Chem, 279(49), 51404-51414.

58. Walter, M. (2009). Interrelationships among HDL metabolism, aging, and atherosclerosis. Arterioscler Thromb Vasc Biol, 29(9), 1244-1250.

59. Navab, M., Anantharamaiah, G. M., Hama, S., Garber, D. W., Chaddha, M., Hough, G., et al. (2002). Oral administration of an Apo A-I mimetic Peptide synthesized from D-amino acids dramatically reduces atherosclerosis in mice independent of plasma cholesterol. Circulation, 105(3), 290-292.

60. Nandedkar, S. D., Weihrauch, D., Xu, H., Shi, Y., Feroah, T., Hutchins, W., et al. (2011). D-4F, an apoA-1 mimetic, decreases airway hyperresponsiveness, inflammation, and oxidative stress in a murine model of asthma. J Lipid Res, 52(3), 499-508.

61. Rosenbaum, M. A., Chaudhuri, P., Abelson, B., Cross, B. N., & Graham, L. M. (2015). Apolipoprotein A-I mimetic peptide reverses impaired arterial healing after injury by reducing oxidative stress. Atherosclerosis, 241(2), 709-715.

62. Garber, D. W., Datta, G., Chaddha, M., Palgunachari, M. N., Hama, S. Y., Navab, M., et al. (2001). A new synthetic class A amphipathic peptide analogue protects mice from diet-induced atherosclerosis. J Lipid Res, 42(4), 545-552.

63. Li, X., Chyu, K. Y., Faria Neto, J. R., Yano, J., Nathwani, N., Ferreira, C., et al. (2004). Differential effects of apolipoprotein A-I-mimetic peptide on evolving and established atherosclerosis in apolipoprotein E-null mice. Circulation, 110(12), 1701-1705.

64. Navab, M., Anantharamaiah, G. M., Reddy, S. T., & Fogelman, A. M. (2006). Apolipoprotein A-I mimetic peptides and their role in atherosclerosis prevention. Nat Clin Pract Cardiovasc Med, 3(10), 540-547.

65. Navab, M., Anantharamaiah, G. M., & Fogelman, A. M. (2008). The effect of apolipoprotein mimetic peptides in inflammatory disorders other than atherosclerosis. Trends Cardiovasc Med, 18(2), 61-66.

66. Navab, M., Anantharamaiah, G. M., Reddy, S. T., Van Lenten, B. J., Buga, G. M., & Fogelman, A. M. (2007). Peptide Mimetics of Apolipoproteins Improve HDL Function. J Clin Lipidol, 1(2), 142-147.

67. Han, J., Zhang, S., Ye, P., Liu, Y. X., Qin, Y. W., & Miao, D. M. (2016). Apolipoprotein A-I Mimetic Peptide D-4F Reduces Cardiac Hypertrophy and Improves Apolipoprotein A-I-Mediated Reverse Cholesterol Transport From Cardiac Tissue in LDL Receptor-null Mice Fed a Western Diet. J Cardiovasc Pharmacol, 67(5), 412-417.

68. Osei-Hwedieh, D. O., Amar, M., Sviridov, D., & Remaley, A. T. (2011). Apolipoprotein mimetic peptides: Mechanisms of action as anti-atherogenic agents. Pharmacol Ther, 130(1), 83-91.

69. Wu, A., Hinds, C. J., & Thiemermann, C. (2004). High-density lipoproteins in sepsis and septic shock: metabolism, actions, and therapeutic applications. Shock, 21(3), 210-221.

70. Anuar, F., Whiteman, M., Bhatia, M., & Moore, P. K. (2006). Flurbiprofen and its nitric oxide-releasing derivative protect against septic shock in rats. Inflamm Res, 55(11), 498-503.

71. Dai, L., Datta, G., Zhang, Z., Gupta, H., Patel, R., Honavar, J., et al. (2010). The apolipoprotein A-I mimetic peptide 4F prevents defects in vascular function in endotoxemic rats. J Lipid Res, 51(9), 2695-2705.

72. Moreira, R. S., Irigoyen, M., Sanches, T. R., Volpini, R. A., Camara, N. O., Malheiros, D. M., et al. (2014). Apolipoprotein A-I mimetic peptide 4F attenuates kidney injury, heart injury, and endothelial dysfunction in sepsis. Am J Physiol Regul Integr Comp Physiol, 307(5), R514-R524.

73. Bloedon, L. T., Dunbar, R., Duffy, D., Pinell-Salles, P., Norris, R., DeGroot, B. J., et al. (2008). Safety, pharmacokinetics, and pharmacodynamics of oral apoA-I mimetic peptide D-4F in high-risk cardiovascular patients. J Lipid Res, 49(6), 1344-1352.

74. Pal, M., & Pillarisetti, S. (2007). HDL elevators and mimetics--emerging therapies for atherosclerosis. Cardiovasc Hematol Agents Med Chem, 5(1), 55-66.

75. Smythies, L. E., White, C. R., Maheshwari, A., Palgunachari, M. N., Anantharamaiah, G. M., Chaddha, M., et al. (2010). Apolipoprotein A-I mimetic 4F alters the function of human monocyte-derived macrophages. Am J Physiol Cell Physiol, 298(6), C1538-C1548.

76. Nissen, S. E., Tsunoda, T., Tuzcu, E. M., Schoenhagen, P., Cooper, C. J., Yasin, M., et al. (2003). Effect of recombinant ApoA-I Milano on coronary atherosclerosis in patients with acute coronary syndromes: a randomized controlled trial. JAMA, 290(17), 2292-2300.

77. Tricoci, P., D'Andrea, D. M., Gurbel, P. A., Yao, Z., Cuchel, M., Winston, B., et al. (2015). Infusion of Reconstituted High-Density Lipoprotein, CSL112, in Patients With Atherosclerosis: Safety and Pharmacokinetic Results From a Phase 2a Randomized Clinical Trial. J Am Heart Assoc, 4(8), e002171.

78. Gilham, D., Wasiak, S., Tsujikawa, L. M., Halliday, C., Norek, K., Patel, R. G., et al. (2016). Corrigendum to "RVX-208, a BET-inhibitor for treating atherosclerotic cardiovascular disease, raises ApoA-I/HDL and represses pathways that contribute to cardiovascular disease" [Atherosclerosis 247 (2016) 48-57]. Atherosclerosis, 247, 48-57.

79. Graziani, G., Degnoni, V., Oldani, S., Buskermolen, M., & Brambilla, G. ([Pathophysiology and prevention of contrast-induced acute renal failure]. G Ital Nefrol, 24 Suppl 38, 20-24.

80. Onozato, M. L., Tojo, A., Goto, A., & Fujita, T. (2004). Radical scavenging effect of gliclazide in diabetic rats fed with a high cholesterol diet. Kidney Int, 65(3), 951-960.

81. Pfeffer, M. A., Pfeffer, J. M., Fishbein, M. C., Fletcher, P. J., Spadaro, J., & Kloner, R. A., et al. (1979). Myocardial infarct size and ventricular function in rats. Circ Res, 44(4), 503-512.

82. Van Liew, J. B., Zamlauski-Tucker, M. J., & Feld, L. G. (1993). Endogenous creatinine clearance in the rat: strain variation. Life Sci, 53(12), 1015-1021.

83. Wang, M., Yip, G. W., Wang, A. Y., Zhang, Y., Ho, P. Y., Tse, M. K., et al. (2005). Tissue Doppler imaging provides incremental prognostic value in patients with systemic hypertension and left ventricular hypertrophy. J Hypertens, 23(1), 183-191.

84. Malfitano, C., de Souza Junior, A. L., Carbonaro, M., Bolsoni-Lopes, A., Figueroa, D., de Souza, L. E., et al. (2015). Glucose and fatty acid metabolism in infarcted heart from streptozotocin-induced diabetic rats after 2 weeks of tissue remodeling. Cardiovasc Diabetol, 14, 149.

85. Wichi, R., Malfitano, C., Rosa, K., De Souza, S. B., Salemi, V., Mostarda, C., et al. (2007). Noninvasive and invasive evaluation of cardiac dysfunction in experimental diabetes in rodents. Cardiovasc Diabetol, 6, 14.

86. Liu, Q., Zhang, J., Xu, Y., Huang, Y., & Wu, C. (2013). Effect of carvedilol on cardiomyocyte apoptosis in a rat model of myocardial infarction: a role for toll-like receptor 4. Indian J Pharmacol, 45(5), 458-463.

87. Wei, L., Wu, R. B., Yang, C. M., Zheng, S. Y., & Yu, X. Y. (2011). Cardioprotective effect of a hemoglobin-based oxygen carrier on cold ischemia/reperfusion injury. Cardiology, 120(2), 73-83.

88. Berges, A., Van Nassauw, L., Timmermans, J. P., & Vrints, C. (2007). Time-dependent expression pattern of nitric oxide and superoxide after myocardial infarction in rats. Pharmacol Res, 55(1), 72-79.

89. Takata, K., Imaizumi, S., Kawachi, E., Yahiro, E., Suematsu, Y., Shimizu, T., et al. (2016). The ApoA-I mimetic peptide FAMP promotes recovery from hindlimb ischemia through a nitric oxide (NO)-related pathway. Int J Cardiol, 207, 317-325.

90. Wu, L., Maimaitirexiati, X., Jiang, Y., & Liu, L. (2016). Parkin Regulates Mitochondrial Autophagy After Myocardial Infarction in Rats. Med Sci Monit, 22, 1553-1559.

91. Shi, J., Dai, W., Hale, S. L., Brown, D. A., Wang, M., Han, X., et al. (2015). Bendavia restores mitochondrial energy metabolism gene expression and suppresses cardiac fibrosis in the border zone of the infarcted heart. Life Sci, 141, 170-178.

92. Wang, J. X., Jiao, J. Q., Li, Q., Long, B., Wang, K., Liu, J. P., et al. (2011). miR-499 regulates mitochondrial dynamics by targeting calcineurin and dynamin-related protein-1. Nat Med, 17(1), 71-78.

93. McBride, H. M., Neuspiel, M., & Wasiak, S. (2006). Mitochondria: more than just a powerhouse. Curr Biol, 16(14), R551-R560.

94. Kuznetsov, A. V., Javadov, S., Sickinger, S., Frotschnig, S., & Grimm, M. (2015). H9c2 and HL-1 cells demonstrate distinct features of energy metabolism, mitochondrial function and sensitivity to hypoxia-reoxygenation. Biochim Biophys Acta, 1853(2), 276-284.

95. Suematsu, Y., Miura, S., Takata, K., Shimizu, T., Kuwano, T., Imaizumi, S., et al. (2016). A novel inducible cholesterol efflux peptide, FAMP, protects against myocardial ischemia reperfusion injury through a nitric oxide pathway. Int J Cardiol, 202, 810-816.

96. Hao, X., Månsson-Broberg, A., Grinnemo, K. H., Siddiqui, A. J., Dellgren, G., Brodin, L. A., et al. (2007). Myocardial angiogenesis after plasmid or adenoviral VEGF-A(165) gene transfer in rat myocardial infarction model. Cardiovasc Res, 73(3), 481-487.

97. Kanashiro-Takeuchi, R. M., Takeuchi, L. M., Rick, F. G., Dulce, R., Treuer, A. V., Florea, V., et al. (2012). Activation of growth hormone releasing hormone (GHRH) receptor stimulates cardiac reverse remodeling after myocardial infarction (MI). Proc Natl Acad Sci U S A, 109(2), 559-563.

98. Wang, G., Hamid, T., Keith, R. J., Zhou, G., Partridge, C. R., Xiang, X., et al. (2010). Cardioprotective and antiapoptotic effects of heme oxygenase-1 in the failing heart. Circulation, 121(17), 1912-1925.

99. Ou, J., Wang, J., Xu, H., Ou, Z., Sorci-Thomas, M. G., Jones, D. W., et al. (2005). Effects of D-4F on vasodilation and vessel wall thickness in hypercholesterolemic LDL receptor-null and LDL

receptor/apolipoprotein A-I double-knockout mice on Western diet. Circ Res, 97(11), 1190-1197.

100. Buga, G. M., Frank, J. S., Mottino, G. A., Hakhamian, A., Narasimha, A., Watson, A. D., et al. (2008). D-4F reduces EO6 immunoreactivity, SREBP-1c mRNA levels, and renal inflammation in LDL receptor-null mice fed a Western diet. J Lipid Res, 49(1), 192-205.

101. Leman, L. J., Maryanoff, B. E., & Ghadiri, M. R. (2014). Molecules that mimic apolipoprotein A-I: potential agents for treating atherosclerosis. J Med Chem, 57(6), 2169-2196.

102. Gui, D., Huang, J., Liu, W., Guo, Y., Xiao, W., & Wang, N. (2013). Astragaloside IV prevents acute kidney injury in two rodent models by inhibiting oxidative stress and apoptosis pathways. Apoptosis, 18(4), 409-422.

103. Xu, Z., Prathapasinghe, G., Wu, N., Hwang, S. Y., Siow, Y. L., & O, K. (2009). Ischemia-reperfusion reduces cystathionine-beta-synthase-mediated hydrogen sulfide generation in the kidney. American Journal of Physiology-Renal Physiology, 297(1), F27-F35.

104. Qi, S., & Wu, D. (2013). Bone marrow-derived mesenchymal stem cells protect against cisplatin-induced acute kidney injury in rats by inhibiting cell apoptosis. International Journal of Molecular Medicine, 32(6), 1262-1272.

105. O'Toole, J. F., Patel, H. V., Naples, C. J., Fujioka, H., & Hoppel, C. L. (2010). Decreased cytochrome c mediates an age-related decline of oxidative phosphorylation in rat kidney mitochondria. Biochemical Journal, 427(1), 105-112.

106. Szeto, H. H., Liu, S., Soong, Y., Wu, D., Darrah, S. F., Cheng, F. Y., ... & Mitochondria-targeted peptide accelerates ATP recovery and reduces ischemic kidney injury. Journal of the American Society of Nephrology, 22(6), 1041-1052.

107. Mostarda, C., Moraes-Silva, I. C., Moreira, E. D., Medeiros, A., Piratello, A. C., Consolim-Colombo, F. M., ... & Baroreflex sensitivity impairment is associated with cardiac diastolic dysfunction in rats. Journal of Cardiac Failure, 17(6), 519-525.

108. Navab, M., Anantharamaiah, G. M., Reddy, S. T., Van Lenten, B. J., Hough, G., Wagner, A., ... & Human apolipoprotein AI mimetic peptides for the treatment of atherosclerosis. Current Opinion in Investigational Drugs, 4(9), 1100-1104.

109. Van Lenten, B. J., Wagner, A. C., Anantharamaiah, G. M., Garber, D. W., Fishbein, M. C., Adhikary, L., ... & Influenza infection promotes macrophage traffic into arteries of mice that is prevented by D-4F, an apolipoprotein A-I mimetic peptide. Circulation, 106(9), 1127-1132.

110. Semba, R. D., Cappola, A. R., Sun, K., Bandinelli, S., Dalal, M., Crasto, C., ... & Plasma klotho and cardiovascular disease in adults. Journal of the American Geriatrics Society, 59(9), 1596-1601.

111. Kanda, E., Ai, M., Okazaki, M., Yoshida, M., & Maeda, Y. (2016). Association of High-Density Lipoprotein Subclasses with Chronic Kidney Disease Progression, Atherosclerosis, and Klotho. PLoS One, 11(11), e0166459.

112. Chapleau, M. W., Cunningham, J. T., Sullivan, M. J., Wachtel, R. E., & Abboud, F. M. (1995). Structural versus functional modulation of the arterial baroreflex. Hypertension, 26(2), 341-347.

113. Feron, O., Dessy, C., Moniotte, S., Desager, J. P., & Balligand, J. L. (1999). Hypercholesterolemia decreases nitric oxide production by promoting the interaction of caveolin and endothelial nitric oxide synthase. Journal of Clinical Investigation, 103(6), 897-905.

114. Liao, J. K., Shin, W. S., Lee, W. Y., & Clark, S. L. (1995). Oxidized low-density lipoprotein decreases the expression of endothelial nitric oxide synthase. Journal of Biological Chemistry, 270(1), 319-324.

115. Pelat, M., Dessy, C., Massion, P., Desager, J. P., Feron, O., & Balligand, J. L. (2003). Rosuvastatin decreases caveolin-1 and improves nitric oxide-dependent heart rate and blood pressure variability in apolipoprotein E-/- mice in vivo. Circulation, 107(19), 2480-2486.

Feelings of health professionals regarding the care of pregnant women with hearing impairment

https://doi.org/10.56238/sevened2024.005-020

Ana Maria Gaboni de Oliveira[1], Maressa Victória Rodrigues de Paula[2], Vitória de Castro Novais[3], Renata Martins da Silva Pereira[4], Clarissa Ferreira Pontual de Oliveira[5], Marcia Figueira Canavez[6], Odete Alves Palmeira[7] and Marcia Maria Bastos da Silva[8]

ABSTRACT

This study deals with the discourse of health professionals who work in primary care about the care of women with hearing loss. Its objectives were: to know the feelings reported by health professionals about the possibility of caring for a pregnant woman with hearing impairment and to discuss the preparation for this care to be of quality. This is a qualitative descriptive research conducted with 31 health professionals (nurses, nursing technicians, nursing assistants and community health agents) from Basic Health Units (UBS) in a municipality in the mid-Paraíba region of the state of Rio de Janeiro. Most of the participants have already had contact with the LIBRAS course and a smaller number have had experience in assisting pregnant women with some hearing impairment. The results allowed the formulation of the following categories: Feeling of powerlessness when caring for a hearing impaired pregnant woman, Feeling of sadness in the face of the care of a hearing impaired pregnant woman and Lack of training to care for a hearing impaired pregnant woman. It is concluded that professionals do not feel prepared to deal with this public, feel powerless and sad in the face of care for hearing-impaired pregnant women and do not feel able to provide safe and quality care.

Keywords: Communication, Nursing, Hearing impairments.

[1] Nursing Student
University Center of Volta Redonda - UniFOA
[2] Nursing Student
University Center of Volta Redonda - UniFOA
[3] Nursing Student
University Center of Volta Redonda - UniFOA
[4] Doctor
State University of Rio de Janeiro – UERJ
[5] Master
University Center of Volta Redonda - UniFOA
[6] Master
University Center of Volta Redonda - UniFOA
[7] Master
University Center of Volta Redonda - UniFOA
[8] Master
University Center of Volta Redonda - UniFOA

INTRODUCTION

Ensuring accessibility is one of the fundamental factors for comprehensive health care for women with disabilities, as well as for the realization of their rights, citizenship, social participation and independence. Health professionals should identify the various barriers that hinder or prevent women with disabilities and reduced mobility from accessing health actions, offers, and services (MINISTRY OF HEALTH, 2019).

Language is one of the main instruments of cultural identity of a community. Thus, for example, what identifies the deaf community is sign language, known in Brazil as Libras. This communication is validated and recognized throughout the national territory, but there is still little inclusion of this knowledge in the curricula of schools and courses in the country (NASCIMENTO, 2011).

In order to promote satisfactory conditions, it is necessary to seek improvements in order to create better communication between the team and these patients, in this case it is necessary to include Libras (Brazilian Sign Language) as a means of social communication and humanization of the care provided.

> The current reality of Primary Care professionals is very complex, because, on the one hand, there is the intention to provide egalitarian and holistic care and, on the other hand, the lack of support for this clientele that finds it very difficult in their care, since the health network does not have a significant number of LIBRAS (Brazilian Sign Language) interpreters who can assist in the outpatient environment (FERREIRA, *et al*, 2019).

Therefore, due to the need for an interpreter, the health professional should adapt by taking courses for a more humanized care that brings mastery for better care. It is also worth mentioning that communication is one of the basic instruments of caring for Nursing and other health professions, and is also considered a competence to be developed in prenatal care.

> Adequate prenatal care, with the early detection and intervention of risk situations, as well as an agile hospital referral system, in addition to the qualification of childbirth care, are the major determinants of health indicators related to mother and baby that have the potential to reduce the main causes of maternal and neonatal mortality (RAMOS *et al*, 2018).

According to Ramos (2018), prenatal care aims at early detection of risk situations, however, pregnant women with hearing impairment often do not have adequate instructions on prenatal care, so they do not regularly seek the Basic Health Unit for routine consultations, due to the lack of preparation of professionals, making it difficult for both parties to understand.

Thus, it is important for health professionals to be aware of the scenario that surrounds these vulnerabilities that appear, for example, in the difficulties faced by women with disabilities to exercise their autonomy in daily life, in the obstacles to the experience of their sexuality, motherhood, lack of communicational and attitudinal accessibility in services, access to assistive

technology devices and health equipment and access to formal schooling and professional qualification (MINISTRY OF HEALTH, 2019).

Although there are Decrees and Laws exposed in the Brazilian legal system that determine LIBRAS as a means of communication and guarantee Deaf inclusion and comprehensive care in the various public services, such conducts are still not characterized as sufficient to extinguish the difficulties associated with communication barriers (FRANCISQUETI, *et al*, 2017).

This is because the absence of specific legislation on the need for interpreters during health care, as well as the obligation of a specific discipline of LIBRAS in the training process of health professionals, prevents this portion of the population from being contemplated during graduation and becomes a barrier to quality care (FRANCISQUETI, *et al*, 2017).

A study carried out in Paraná points out the importance of using LIBRAS during the care provided to deaf clients, aiming at the establishment of a more inclusive society, in which adequate care is offered to the deaf as well as to the entire population, the professionals also mention the relevance of the health unit having a professional trained in LIBRAS, as a reference to deaf individuals. (FRANCISQUETI, et al, 2017)

The objectives of the research were: To know the feelings reported by health professionals about the possibility of caring for a pregnant woman with hearing loss; and to discuss the professionals' view of their preparation for this quality care.

METHODOLOGY

This is a qualitative descriptive research carried out with professionals who make up the nursing team (nurses, nursing technicians, nursing assistants and community health agents) of Basic Health Units (UBS) of a municipality in the mid-Paraíba region of the state of Rio de Janeiro.

The professionals were invited to participate in the research, which had the following inclusion criteria: being part of the nursing team and accepting to participate in the research, and the exclusion criterion being on vacation and/or sick leave, premium/maternity leave during the data collection period.

Data were collected in the first half of 2023 in the health units themselves, through the application of a recorded semi-structured interview, with a script of questions on the topic in question.

The interview questions are based on a study conducted in Paraná with nursing professionals (FRANCISCHETTI, et al, 2017) where the following questions are asked: How do you feel/would you feel when caring for a deaf pregnant woman? What do you think could be improved in the care offered in health services for deaf pregnant women?

The analysis consisted of floating reading; constitution of the corpus, through the search for exhaustiveness, representativeness, homogeneity and pertinence of the data listed. The formulation and reformulation of hypotheses (units of registration, context, form of categorization) and the phase of organization of the material that was analyzed were carried out, aiming to systematize the ideas and transform them into categories (BARDIN, 2011).

The project was submitted to the Research Ethics Committee of UniFOA and approved under Opinion No. 5,877,552, according to Resolution 466, which deals with research with human beings.

All study participants signed the Informed Consent Form (ICF) in two copies. In order to ensure the secrecy and confidentiality of the participants, the nurses identified by the letter "E´´; nursing technicians by the letter "T´´; nursing assistants by the letter "A´´, and; community health agents were assigned by the letter "C", followed by an Arabic number, according to the order of the interviews.

RESULTS AND DISCUSSION

According to the data collection, carried out in 10 Basic Health Units, in the municipality of Volta Redonda/RJ of District II, with a total of 31 health professionals, it was possible to characterize them as: 14 community health agents, 1 man aged 50 years and 13 women, with ages ranging from 25 to 50 years. Other professionals approached in the interview were 10 nursing technicians, 1 49-year-old man and 9 women aged 23 to 59 years. The remaining professionals participating in the research were 7 nurses with ages ranging from 23 to 50 years.

7 (22,58)

Variable	N (%)
Interviewed	31 (100)
Nurses	7 (22,58)
Nursing Technicians	10 (32,25)
Community Health Agents	14 (45,16)
Basic course in pounds	
Yes	5 (16,12)
No	26 (83,87)
Experience in caring for hearing impaired pregnant women	
Yes	4 (12,90)
No	27 (87,09)
Sex	
Feminine	29 (93,54)
Masculine	2 (6,45)
Age years	
23 - 33	14 (45,16)
34 - 44	7 (22,58)
≥ 45	10 (32,25)

Source: Survey data, 2023.

CATEGORY 1: FEELING OF POWERLESSNESS WHEN CARING FOR A HEARING IMPAIRED PREGNANT WOMAN

In this first category, the team's concern about the impossibility of providing qualified and efficient care to pregnant women with hearing impairment is clear, in the absence of preparation to assist them using the language of LIBRAS. The following statements convey this feeling:

> "(...) feeling of powerlessness because there is no specific preparation within the network to assist these people." (ENF 1)
> "It's a feeling of impossibility of not being able to attend, the difficulty in attending." (CHA 6)
> "(...) I feel helpless, because it's going to make it very difficult for you to be able to help this person." (TEC 9)
> "(...) feeling of powerlessness, inability to provide care in the way it should be" (TEC 10)

The care of deaf people is a challenge for health professionals and for the deaf themselves. The absence of a companion is a barrier to the care of deaf users, which makes it difficult and vulnerable to clients at the time of care. The presence of a companion during consultations should be encouraged to facilitate communication and engagement of the client during prenatal care (NARCIZO *et. al,* 2022).

One of the main objectives of primary care is to attribute social visibility to the construction of inclusion, minimizing prejudices, guaranteeing rights, establishing support networks, creating opportunities for socialization and thus providing improved access to health services. (PEREIRA *et. al,* 2020).

There is an urgent need for other means to communicate with these users. The communication barriers encountered by health professionals and deaf patients, in most cases, are detrimental to the diagnosis and treatment of these patients' diseases. In health care, only through good communication can patients' needs be identified and resolved in a humanized way. For the nursing team, communication with these patients may be impaired with regard to the exchange of information, lacking skills in transmitting information about their health and thus impairing the confidentiality of the consultation. (NARCIZO *et. al,* 2022).

Despite the rarity of recent studies that describe the negative feelings of health professionals in the care of hearing-impaired pregnant women, some previous studies demonstrate the difficulties of health professionals in the care of the hearing impaired, reporting their dissatisfaction and lack of mastery by them in the adequate and broad care of women.

The feeling of powerlessness when caring for a hearing impaired pregnant woman is understandable, even so there are other ways and resources, such as writing and the use of illustrative materials, so that her needs are met, allowing the pregnant woman to feel understood, welcomed and well cared for during this period.

CATEGORY 2: FEELING OF SADNESS IN THE FACE OF THE CARE OF A HEARING IMPAIRED PREGNANT WOMAN

Health professionals who provide care to people at all stages of their lives experience diverse feelings, most of the time positive, but when they do not achieve their goals, they may experience sadness in the face of the impotence to promote care effectively. This is what can be observed in the statements below, where the research participants report sadness and frustration in the face of the impossibility of providing adequate care and communication.

> "(...) I find myself with a feeling of incapacity, difficulty in communication" (ENF 2)
> "I'm a little embarrassed, it hasn't happened yet, but I'd be very uncomfortable" (CHA 3)
> "Sadness, frustration" (CET 1)
> "I'd be a little sad not to know, I don't even know how to speak her language, that's how I would feel, with difficulty dealing with her" (TEC 8)

There are improvements in the field of care for people with hearing impairment (AD), but they face social vulnerabilities related to low socioeconomic and educational level, as they deal with barriers to access to dignified living conditions and the search for health care. Added to this, they have difficulties to establish effective communication with health professionals, and the promotion of social inclusion in the care of the deaf by health professionals becomes a priority element for the quality of the service provided, considering that the absence of effective communication does not provide humanized care, aligned with the principles of the Unified Health System (SUS). (KINGS *et. al,* 2020).

In addition, it is through communication that professionals understand the user as a holistic being and understand their social insertion and their worldview, being able, from this moment on, to raise their anxieties and needs, developing adequate care, so that the discomforts of this process can be minimized. (KINGS *et. al,* 2020).

Even with the failure in communication when the institution does not have a LIBRAS interpreter, the hearing impaired seek ways to make this communication ideal with health professionals, for example, gestures, drawing and writing according to their level of knowledge.

In a consultation, it is necessary to implement educational actions to better understand this public, so the health professional should seek means for adequate and humanized communication, and that guarantees the rights of the pregnant woman when being attended during prenatal care. In this way, allowing the promotion of the health of the mother and child binomial and preventing complications that may be present in the gestation process.

According to Aires (2019), feelings such as shame can be placed in relation to the other, as mentioned by health professionals, some have the feeling of shame in a possible care for the hearing impaired pregnant woman. As a result, some professionals feel fear, insecurity, difficulty, frustration, sadness and shame for not being able to provide quality care. This reality demonstrates commitment

on the part of the professionals, who know that something is missing for their care to be complete and effective for their hearing loss, and for this reason they report feelings of shame and frustration.

It is essential that professionals are trained for this care, being efficient and inclusive for all hearing impaired people, because through permanent education in health it is possible to reverse gaps in knowledge, attitudes and professional practices, allowing the construction of skills to care for people with disabilities.

CATEGORY 3: LACK OF TRAINING TO CARE FOR A HEARING IMPAIRED PREGNANT WOMAN

Continuing education in health services can minimize difficulties in the day-to-day life of professionals who serve the community, and it is necessary to meet the demands as explained in the statements below, the lack of knowledge, training and practice related to the use of LIBRAS during the care of pregnant women, when necessary.

> "It's trying to welcome into my reality and hers without training, right? Because I wouldn't have the technical knowledge to do that, but they help us much more than we do" (NFL 6)
> "Actually, there's no preparation, right? Then there would be no quality precisely because we are not prepared, we are not oriented, we do not know how to do it in her situation" (CHA 1)
> "We didn't have this preparation here, so I don't understand anything about sign language, I'm going to have a difficulty, but I'll try to serve in the best way" (CHA 6)
> "I don't have any qualifications to be able to do this care with a hearing impaired patient. Even more so a pregnant woman here in the unit for not having had this training. We didn't have the opportunity to have this training here at the unit or by the city hall, which varies with us adding more value to our knowledge" (CHA 9)
> "(...) I prepare 0, I would try to serve in the best way, but I am not prepared" (TEC 3)

Permanent Health Education (EPS), inserted by the Ministry of Health as a health policy in Brazil through Ordinances No. 198/2004 and No. 1,996/2007, aims to guide the training and qualification of professionals inserted in public health services, with the purpose of transforming professional practices and the organization of work based on the needs and difficulties of the system. (FERREIRA *et. al*, 2019).

In the field of health, EPS is defined as a pedagogical process that analyzes the daily routine of health work or education, based on the assumption of meaningful learning that allows health professionals themselves to reflect on the reality they live and the health care models in which they are inserted, as well as the problems they face. Thus, it is understood that the EPS has, in the scenario of practices, the work process as an object of transformation, starting from the critical reflection of the professionals about what is happening in the daily routine of the services and seeking solutions together with the team to the problems encountered. (FERREIRA *et. al*, 2019).

Thus, we can observe that many professionals mentioned that they do not have the qualification for this care, when the institution does not provide the professionals with a qualification, it is rooted in the traditional model and with the non-inclusion of these patients.

Thus, it is necessary that educational processes are inserted in the daily routine of professionals, so that the services are prepared to provide adequate care to the different audiences that need care. In this sense, it is important to think of health work as a key element for this process to become a reality in the Unified Health System (SUS), because health work is considered a "living work in action". Thus, instruments, knowledge and relationships are essential for the work process to be effective in the production of care and in the organization of health care.

That said, it is necessary to unite the team and participate in the context of Permanent Health Education, meetings to discuss educational actions for the care and inclusion of these patients. Many professionals perform care in a non-humanized way, where they approach the patient and do not understand the importance of quality care.

With EPS we can enhance the desire to acquire new knowledge. During the weekly meetings of Primary Health Care, the difficulties faced in the care of hearing-impaired pregnant women can be addressed, bringing experiences and experiences for the collective construction and resolution of the difficulties faced by the team.

CONCLUSION

This study uncovered the practice of health professionals when dealing with pregnant women with hearing loss, and demonstrated weaknesses in this practice.

It was concluded that professionals do not feel prepared to deal with this public, feel powerless and sad in the face of care for hearing-impaired pregnant women and do not feel able to provide safe and quality care.

Paths are pointed out aimed at the qualification and permanent education in health of the teams to face challenges when serving specific groups and allow the inclusion and respect for the rights of all pregnant women to quality prenatal care, with safe information that leads to the safety of pregnancy, childbirth and postpartum.

This study has as limitations the small number of participants who had effective contact and experience with pregnant women with hearing impairment and the scenario restricted to a health district of a municipality in the interior of the state of Rio de Janeiro, so new studies are suggested that broaden the vision of professionals regarding the care of this public in order to provide an opportunity for discussion and support for more humanized and safer nursing practices.

REFERENCES

1. AIRES, S. Uma cena para a perda: vergonha e melancolia. *Discurso, 49*(1), 101-113. https://doi.org/10.11606/issn.2318-8863.discurso.2019.159287

2. ALBUQUERQUE, A. K. R., & GOMES SOBRINHO, J. L. Dificuldades na comunicação com portadores de deficiência auditiva. UNICEPLAC, Brasília: UNICEPLAC, 1-11. Retrieved from https://dspace.uniceplac.edu.br/bitstream/123456789/75/1/Jennifer%20Sobrinho_0000200.pdf

3. BARDIN, L. (2011). *Análise de conteúdo*. Lisboa: Edições 70.

4. BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. (2019). *Guia de Atenção à Saúde das Mulheres com Deficiência e Mobilidade Reduzida*. Brasília: Ministério da Saúde.

5. FERREIRA, D. R. C. et al. Assistência à gestante surda: barreiras de comunicação encontradas pela equipe de saúde. *Saúde em redes, 2019*(3), 31-42. Retrieved from http://revista.redeunida.org.br/ojs/index.php/rede-unida/article/view/2234

6. Ferreira, L., Barbosa, J. S. D. A., Esposti, C. D. D., & Cruz, M. M. D. (2019). Educação Permanente em Saúde na atenção primária: uma revisão integrativa da literatura. *Saúde em Debate, 43*, 223-239.

7. FONSECA, M. C. da, & CARVALHO, J. M. *Deficiência Auditiva*. Cadernos da TV escola, 2000(2), 5-59. Retrieved from http://portal.mec.gov.br/seed/arquivos/pdf/deficienciaauditiva.pdf

8. FRANCISQUETI, V., FERRAZ TESTON, E., RAMOS COSTA, M. A., & SOARES DE SOUZA, V. Sentimentos da equipe de enfermagem ao atender um deficiente auditivo: desafios do cuidado. *Revista Educação, Artes e Inclusão, 13*(3), 031-051. Retrieved from https://www.revistas.udesc.br/index.php/arteinclusao/article/view/9529

9. LIMA, R. F. de F., & LIMA, R. de F. COMUNICAÇÃO COM O DEFICIENTE AUDITIVO: DIFICULDADES NA PRÁTICA DO PROFISSIONAL DA SAÚDE. IV jornada acadêmica do hospital universitário professor Alberto Antunes, 375-382. Retrieved from https://www.seer.ufal.br/index.php/gepnews/article/download/7929/5765

10. NARCIZO, B. A. et al. COMUNICAÇÃO DE ENFERMEIROS COM DEFICIENTES AUDITIVOS: UMA REVISÃO INTEGRATIVA. *Revista de Iniciação Científica da Libertas, 2022*, 14-32. Retrieved from http://www.libertas.edu.br/revistas/index.php/riclibertas/article/view/143

11. NASCIMENTO, W. F. do. Desafio do Enfermeiro na Consulta à Gestante Surda: relato de experiência. *Researchgate, 2011*, 2-7. Retrieved from https://www.researchgate.net/profile/Vagner-Ferreira-Do-Nascimento-2/publication/320555372_Nurse's_challenge_in_consulting_the_deaf_pregnant_woman_experience_report_Desafio_del_enfermero_en_la_consulta_a_la_gestante_sorda_relato_de_experiencia_Desafio_do_enfermeiro_na_consulta_a_gestante_su/links/5d2388b392851cf440726b0c/Nurses-challenge-in-consulting-the-deaf-pregnant-woman-experience-report-Desafio-del-enfermero-en-la-consulta-a-la-gestante-sorda-relato-de-experiencia-Desafio-do-enfermeiro-na-consulta-a-gestante-s.pdf

12. PEREIRA, V. F. R. et al. Cuidado de enfermagem às pessoas com deficiência na Atenção Primária à Saúde. *Global Academic Nursing, 2020*, 1-8. Retrieved from https://globalacademicnursing.com/index.php/globacadnurs/article/view/9/13

13. PINHEIRO, G. E. W., AZAMBUJA, M. S. de, & BONAMIGO, A. W. Facilidades e dificuldades vivenciadas na Educação Permanente em Saúde, na Estratégia Saúde da Família. *Saúde Debate, 2018*(4), 187-197. Retrieved from https://www.scielo.br/scielo.php?pid=S0103-11042018000500187&script=sci_arttext

14. RAMOS, A. S. M. B. et al. A assistência pré-natal prestada pelo enfermeiro sob a ótica das gestantes. *DIALNET, 2018*(2), 87-96. Retrieved from https://dialnet.unirioja.es/servlet/articulo?codigo=6763719

15. REIS MORENO, R. S. dos et al. Tecnologias assistivas na comunicação de pacientes com deficiência auditiva em serviços de saúde no Brasil / Assistive technologies in communicating patients with hearing disabilities in health services in Brazil. *Brazilian Journal of Development, 6*(8), 58079–58101. https://doi.org/10.34117/bjdv6n8-281

16. SILVA, K. R. D., CARDOSO, W. de J. L., & FERREIRA, J. N. A comunicação como ferramenta de acessibilidade às mulheres surdas no pré-natal. *Repositório Faculdade Laboro, 2019*(3), 1-7. Retrieved from http://repositorio.laboro.edu.br:8080/jspui/handle/123456789/323?mode=simple

17. VIEIRA, C. M., CANIATO, D. G., & YONEMOTU, B. P. R. Comunicação e acessibilidade: percepções de pessoas com deficiência auditiva sobre seu atendimento nos serviços de saúde. *RECIIS, 2017*(2), 1-11. Retrieved from https://www.reciis.icict.fiocruz.br/index.php/reciis/article/view/1139

Digital tools for care-related infection prevention in intensive care units: An integrative review

https://doi.org/10.56238/sevened2024.005-021

Diego Bruno Santos Pinheiro[1], Liliane Sousa Borges Pinheiro[2], Viviane Sousa Borges Lima[3], Fernanda Maria Gonçalves[4], Francisco Edson das Chagas Silva[5], Arkila Pinheiro Rodrigues de Sousa[6], Wellington Costa Tomaz[7], Priscila Dias Pinto[8] and Hiasmin Batista Rodrigues[9]

ABSTRACT

The study aimed to map digital tools with collective interventions and potential guidelines and limitations in the prevention of care-related infections in intensive care units. This is an integrative literature review, to survey the articles in the literature, a search was carried out in the following databases: Latin American and Caribbean Literature in Health Sciences and Medical Literature Analysis and Retrieval System Online, National Library of Medicine and National Institutes of Health and Nursing Database from April to May 2022. Inclusion criteria: articles published in Portuguese and English, in the years 2011 to 2021, available free of charge and in full. Articles that did not have a well-defined research design were excluded. A total of 1,666 articles were found, and after defining the inclusion and exclusion criteria, 305 articles remained, of which ten articles were included in the search. The use of applications is very common among health services and helps

[1] Nurse, Intensive Care, Urgency and Emergency Specialist
Fortaleza General Hospital-HGF.Brazil
E-mail: diego.pinheiro90@gmail.com
ORCID: https://orcid.org/0009-0001-9247-4013
[2] Nurse, Specialist in pediatric and neonatal nursing. GRAPE
Northern Regional Hospital, Brazil
E-mail: lilianeborgesp@gmail.com
ORCID: https://orcid.org/0009-0006-8099-1351
[3] Nurse, Nursing Specialist, Surgical Center and CME
Northern Regional Hospital, Brazil
E-mail: vivisborges_@hotmail.com
ORCID: https://orcid.org/0000-0003-1067-3201
[4] Nurse, Intensive Care Specialist UECE
Salute Courses and Consulting, Brazil
E-mail: nanda_nursing@hotmail.com
ORCID: https://orcid.org/0000-0003-0610-7741
[5] Specialization in Intensive Care Nursing.
Teresina School of Science and Technology, FACET, Brazil.
Northern Regional Hospital, Brazil
E-mail: edsonsilva8866@hotmail.com
ORCID: https://orcid.org/0000-0001-8114-621X
[6] Pharmacist, Post-graduation in Clinical Pharmacy and pharmaceutical prescription
Sertão Central Regional Hospital, Brazil
E-mail: arkilapinheiror@gmail.com
ORCID: https://orcid.org/0000-0002-0145-3664
[7] Physician.- Post-Graduation in Intensive Care Medicine
Northern Regional Hospital, Brazil
E-mail: wellingtontomaz10@gmail.com
ORCID: https://orcid.org/0009-0006-0238-1582
[8] Nurse, specialist in operating room and sterilization material center
Northern Regional Hospital, Brazil
E-mail: pixilha@hotmail.com
[9] Nurse, Specialization in Urgency, Emergency and ICU from Faculdade Ateneu
Northern Regional Hospital, Brazil
E-mail: hiasmin.6@gmail.com

in the organization of data, enabling access to information in real time and/or remotely. It is worth noting that the methods of developing these technologies are complex, involving a mix of instructional, systematized, contextualized, and user-centered design. The present study, in view of the literature found, and the evidence presented, shows the importance of technologies in the critical environment in terms of infection prevention, as well as the relevance of constantly updating and building technologies that promote the prevention and optimization of diseases in the work process.

Keywords: Sepsis, Intensive Care Unit, Infection prevention.

INTRODUCTION

Healthcare-Associated Infections (HAIs) are infections acquired during patient care due to an imbalance between body defenses and microbiota, and are considered one of the most common complications of care; they represent a high risk to patient health/safety and are seen as a public health problem (Pereira *et al.,* 2016).

In relation to the hospital environment, it is noteworthy that the factors related to the occurrence of HAI can be related to three areas: iatrogenic (undesirable harm to the patient caused by the action of the health agent voluntarily or involuntarily organizational and related to the patient (Torres, *et al*., 2021).

In view of the demand for complex activities in a critical environment, risks of infection inherent to all procedures, it is necessary to constantly update professionals, having technological tools as an apparatus for this, since professionals have little time and the practicality offered. Health technology is "medicines, materials, equipment and procedures, organizational, educational, information and support systems, and care programs and protocols", where, through them, the health, well-being, and safety of the patient are promoted, and the prevention of errors and damages is inserted in this context (Brasil 2010).

Sepsis is considered the leading cause of death in ICUs of all ages. There are approximately 47 million cases each year, and the mortality rate of its severe form, especially in the areas of preference, is more than 50%. Due to late diagnosis and lack of intensive care beds (Viana, et al., 2020).

At this juncture, the important thing is that technological tools are capable of qualifying permanent education practices, through a vision of co-participation among the team mediated by interactivity and creativity (Salvador, *et al.,* 2015)

In view of the aforementioned context and with a nurse with more than ten years of experience in the care of critically ill patients and identifying a high incidence of HAIs, with severe and fatal outcomes, the need arose to develop a study that would allow the analysis of digital tools in line with information about the prevention of infections in ICUs, focusing on collective interventions that can be carried out with the team. its potential for orientation and limitations in relation to the proposed purpose.

Based on these reflections, the study has as its guiding question: which literatures, collective interventions and existing contents in the technological tool have the potential to guide and limitations in the prevention of infection related to care in intensive care units?

The study is relevant because it points out the quality of virtual guides on HAI prevention in ICUs, their strengths and limitations, as well as because it strengthens the discussion of the

importance of in-service education and aims to map digital tools with collective interventions and potential guidance and limitations in the prevention of care-related infection in intensive care units.

METHODOLOGY

This is an integrative literature review (IR) According to Mendes et al. (2019), synthesizing knowledge is a scientific methodology that summarizes evidence from several studies on a specific issue, identifying research gaps and suggesting new studies in order to support decision-making in health. They add that IR is a method that allows this synthesis of knowledge through a systematized and rigorous process

In the first stage of the study, to identify the theme and select hypotheses, we used the anagram PICo to guide the problem question, with P for population; I for intervention; Co: context (Anima educação, 2014). Thus, the following question was asked: "What are the collective interventions and existing contents of the virtual guide technological tool with guidance potentials and limitations in the prevention of care-related infection in intensive care units?" Where P: nurses, nurses, nursing, nurse; I: digital technology, e-health, management;infection control; Co: Intensive Care Units, Intensive Care Units.

To survey the articles in the literature, we searched the following databases: Latin American and Caribbean Health Sciences Literature (LILACS) and Medical Literature Analysis and Retrieval System Online (MEDLINE), National Library of Medicine and National Institutes of Health (PUBMED) and Nursing Database (BDENF) from April to May 2022.

The selection of these databases is justified due to the wide availability of national and international articles with a broad impact in the area of health. The following controlled descriptors will be used to search for articles, indexed in the Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH), and their combinations in English, Portuguese, and Spanish. The descriptors were cross-referenced and combined with Boolean operators 'AND' and 'OR' in order to refine the studies according to the topic in question. The following keywords appear:

"Nurses, nurses, OR Nursing, AND AND "Digital Technologies" OR Applications(application) OR "inovation and health" AND e-health OR "infection control" OR "infection prevention" OR infection control AND "Intensive Care Units" OR "Intensive Care Center".

In the second stage, we adopted as inclusion criteria: articles published in Portuguese and English, in the years 2011 to 2021 available free of charge and in full that portray the theme studied, articles published and indexed in the aforementioned databases. Articles that did not present a well-defined research design, that did not make the full text available, or that addressed other aspects related to the prevention of infection in the ICU, such as: self-care, letter to the reader, opinion articles, home care were excluded

In the third stage of the study, the information to be extracted from the studies was defined, in this way, the analysis of the information will be possible from the full reading of the articles in an exploratory way, later they will be stored in a table containing the title of the study, journal published, place of research, year of publication, methodological characteristics (type of study), subjects/objects of the research, and results obtained (Galvão, 2006).

For the categorization of the level of evidence (NE), we opted for the categorization of the level of evidence (NE), proposed by Melnyk & Fineout-Overholt (2005): level 1 – evidence from a systematic review or meta-analysis of relevant randomized controlled clinical trials or from clinical guidelines based on systematic reviews of randomized controlled clinical trials; level 2 – evidence obtained from at least one well-designed randomized controlled trial; level 3 – evidence obtained from well-designed clinical trials without randomization; level 4 – evidence from well-designed cohort and case-control studies; level 5 – evidence from a systematic review of descriptive and qualitative studies; level 6 – evidence from a single descriptive or qualitative study; Level 7 – Evidence from the opinion of authorities and/or the report of expert committees

In the fifth stage, the presentation of the results and discussion of the data obtained was done in a descriptive and analytical way, based on the exploration of the material, developed from the rereading of the texts, which culminated in the construction of thematic categories of analysis. Subsequently, in the stage of interpretation of the results, the existing statements were observed from the perspective of different authors (Jorge et al., 2022).

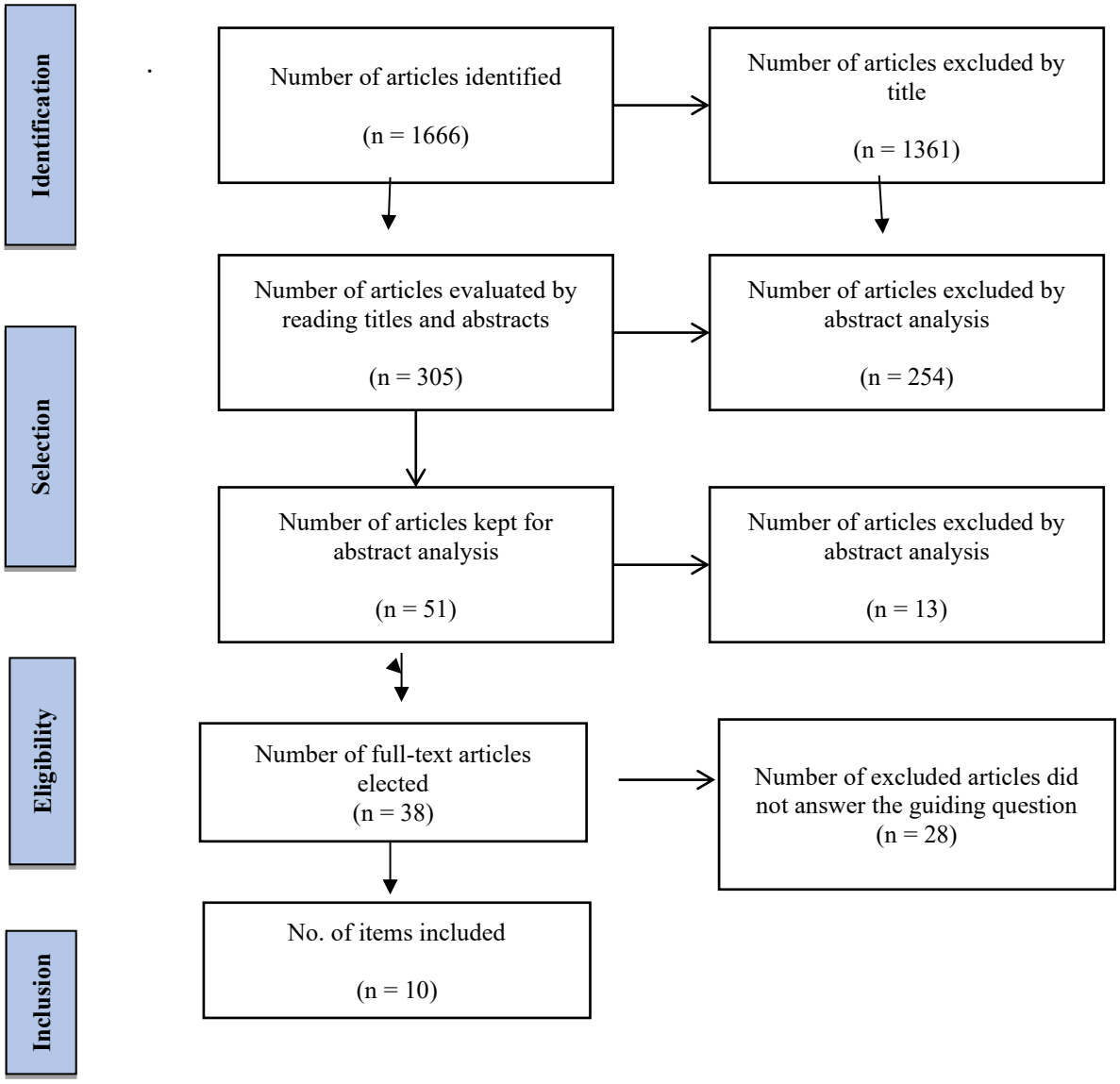
The last phase consisted of the elaboration of this study, which sought to describe in a clear and systematic way all the steps taken by the authors for the elaboration of the research and to present the main results evidenced from the analysis of the included articles.

RESULTS AND DISCUSSION

A total of 1666 articles were found: after the delimitation of the inclusion and exclusion criteria, 1361 articles were eliminated, leaving 305 articles, of which 254 were excluded by the analysis of the abstract. Of the remaining 51 articles, ten articles were included in the study according to the inclusion and exclusion criteria (FIGURE 1).

Of the selected articles, four were identified in the Pubmed database and eight in the LILACS database, two in the Medline database and five in the BDENEF. However, it is difficult to identify articles in other databases

Figure 1 - Flowchart of articles from the Integrative Review



Source: prepared by the authors

Chart 1 below presents the results of the filtering performed and, which constitute the "corpus" of the research, the inclusion and exclusion criteria were applied, resulting in a final sample of 10 articles distributed in the databases

Author Study title	Magazine published	Year of publication	Kind of study	Study subjects	Purpose of the study	Level of evidence
CHAOFAN WANG ET AL; SISTEMAS DE MONITORAMENTO ELETRÔNICO PARA HIGIENE DAS MÃOS: REVISÃO SISTEMÁTICA DA TECNOLOGIA	**J Med Internet Res**	2021	SYSTEMATIC REVIEW	SYSTEMATIC STUDIES IN PUBMED, ACM DIGITAL LIBRARY AND IEEE XPLORE DIGITAL LIBRARY FOLLOWING PRISMA GUIDELINES	SUMMARIZE THE LATEST TECHNOLOGIES ADOPTED IN ELECTRONIC HAND HYGIENE MONITORING SYSTEMS AND DISCUSS THE CAPABILITIES AND LIMITATIONS OF THESE SYSTEMS.	1
ELIEZER FARIAS DE MELO ET AL; DESENVOLVIMENTO DE WEBSITE PARA ENFERMAGEM EM CUIDADOS CRÍTICOS SOBRE INFECÇÃO RELACIONADA À ASSISTÊNCIA À SAÚDE	**Revista Brasileira de Enfermagem**	2021	DESCRIPTIVE METHODOLOGY	INTENSIVE CARE UNIT NURSING	DESCRIBE THE DEVELOPMENT OF A WEBSITE ABOUT THE MAIN HAIS AND RESPECTIVE BUNDLES THAT CAN BE USED TO PREVENT THESE DISEASES, AIMED AT NURSING WORK IN ICUS	6
THIAGO QUINELLATO LOURO ET AL.; A TERAPIA INTENSIVA E AS TECNOLOGIAS COMO MARCA REGISTRADA	**Rev. Pesqui. (Univ. Fed. Estado Rio J., Online)**	2012	DESCRIPTIVE, EXPLORATORY, WITH A QUANTITATIVE-QUALITATIVE APPROACH	NURSES AND NURSING TECHNICIANS WHO CARRIED OUT CARE ACTIVITIES IN INTENSIVE CARE CENTERS	DESCRIBE THE USE OF HARD TECHNOLOGIES IN INTENSIVE CARE UNITS FROM THE PERSPECTIVE OF THE NURSING TEAM; AND ANALYZE THE IMPLICATIONS OF THIS USE IN ASSISTING CRITICALLY ILL CLIENTS IN INTENSIVE CARE.	6
ISABELA SHUMAHER FRUTUOSO ET AL.; CRIAÇÃO DE UM AMBIENTE VIRTUAL DE APRENDIZAGEM EM TERAPIA INTENSIVA	Rev. enferm. UFPE on line	2019		PROFESSIONALS WHO MAKE UP THE ICU NURSING TEAM	CREATE A VIRTUAL LEARNING ENVIRONMENT (VLE) FOR CONTINUING EDUCATION IN INTENSIVE CARE UNITS	6
PATRÍCIA KUERTEN ROCHA ET AL; CUIDADO E TECNOLOGIA EM TERAPIA INTENSIVA	**Index Enferm**	2013		TECHNOLOGIES IN INTENSIVE CARE ENVIRONMENT	DESCRIBE TECHNOLOGIES IN AN INTENSIVE CARE ENVIRONMENT	6
GEISA REGINA DOMINGOS MELLO ET AL Sepsiscare: avaliação de aplicativo móvel no cuidado de enfermagem ao paciente com sepse	Cogitare Enferm	2018	DESCRIPTIVE, TRANSVERSAL	SIX NURSES FROM THE INTENSIVE CARE UNIT OF A PUBLIC HOSPITAL IN SANTA CATARINA PARTICIPATED IN THE STUDY.	EVALUATE A MOBILE APPLICATION FOR THE PREVENTION, IDENTIFICATION AND NURSING CARE OF SEPTIC PATIENTS	6
ANDRÉ LUIZ ALVIM, BRAULIO COUTO **hands clean – taxa automática para higienização das mãos: desenvolvimento de aplicativo para controladores de infecção**	Enfermagem em foco	2019	QUALITATIVE APPROACH AND DESCRIPTIVE NATURE.	CONTROLLERS	DEVELOP AN APPLICATION TO EVALUATE HAND HYGIENE PRACTICES IN HEALTHCARE SERVICES	6
GERALDO MAGELA SALOMÉ;GISLAINE CRISTINA MARTINS ROSA;JONAS ISAC DA ROSA	Rev. Enferm. Contemp	2021	DESCRIPTIVE STUDY	OF INFECTION, WHO WORK IN PUBLIC INSTITUTIONS	BUILD AND VALIDATE A MULTIMEDIA APPLICATION ON A MOBILE	6

Validação do aplicativo móvel Asptraqueal para aspiração					PLATFORM TO GUIDE THE PROCEDURE STEP BY STEP	
ANTONIO HENRIQUE SILVA DOS SANTOS ET AL UTI Escore - protótipo de aplicativo para gestão da assistência de enfermagem	J. Health Inform.	2020	METHODOLOGICAL	NURSES AND PHYSIOTHERAPISTS	SUCTION OF THE ENDOTRACHEAL CANNULA AND AIRWAYS	6
VITTORIA DE ARAÚJO BARRETO, ISABEL CRISTINA FONSECA DA CRUZ Qual a melhor tecnologia digital para intervenção de enfermagem no cuidado da ferida cirúrgica na UTI? -	Cuidados de enfermagem especializados	2021	DESCRIPTIVE	PATIENTS TREATED IN THE ADULT NEUROLOGY INTERNSHIP AT THE UNIFOR HEALTH SCHOOL CLINIC	TO ANALYZE THE PREVALENCE, AS WELL AS THE MAIN EPIDEMIOLOGICAL VARIABLES RELATED TO STROKE, THROUGH THE EVALUATION FORMS OF PATIENTS TREATED IN THE ADULT NEUROLOGY INTERNSHIP AT THE UNIFOR HEALTH SCHOOL CLINIC	1

Source: The author.

DISCUSSION

From the perspective of technology, the vision of care reflects on the inherent capacity of human beings to seek innovations that transform daily life, To understand the current context of care and the art of care in the technological world of Intensive Care Units (ICU), it is necessary to review and reflect on the different historical moments, on the understanding of the cultural and technological evolution that new concepts about care and technology within the ICU. Technology as a process implies knowledge and skills, and should be distinguished from technology as a product, which is represented by technological equipment or devices, which configure an expression of technology that results from the knowledge that makes a team possible (Rocha et al. 2013).

The technology is used in the search for a safe practice to implement a standard of service of excellence. In order to carry out a safe practice with options that indicate referral care, nurses increasingly use knowledge mainly from the use of hard soft technology, such as the use of *guidelines,* consensus, algorithms, among others, which are proposed by different societies or foundations (Rocha et al. 2013).

The use of technological tools was introduced in the nursing field more than 40 years ago and continues to expand, as this type of aid has been used to facilitate decision-making and bring agility to the work. With the use of these technologies, better professional performance and optimization of care are observed, thus helping in the prompt identification, diagnosis and treatment of diseases. This true revolution generates demand for a new nursing professional, not only capable of using these new tools, but also able to create and model new care instruments (Mello et al, 2018).

It is important to emphasize that the significant use of health technologies aims to ensure quality and safety, providing improvement in communication and care management. These applications have been used in the most diverse contexts, from the training of some technique such as cardiopulmonary resuscitation to the aid in the self-management of some disease such as asthma (Mello et al, 2018)

The construction of applications should be strongly based on the literature and clinical evidence in order to provide technological, technical, clinical, administrative and financial support, always aiming at improving patient care and the best results for the institution (Salomé; Rose; Rosa, 2021).

Applications in the health area are technologies that guide decision-making in the face of clinical care issues, add scientific rationality and serve as guides for clinical diagnosis, self-care, prevention and treatment of chronic and acute diseases. They provide information about the best prophylactic-therapeutic conduct to be adopted in each clinical evaluation and procedures performed by health professionals, which confirms their proficiency and accuracy as a guiding instrument for care. The elaboration and structuring of the application should be composed of the evaluation of the application by a professional with knowledge in the area, care actions and therapeutic proposal (Salomé; Rose; Rosa, 2021).

The practicality of digital tools, such as mobile devices, corroborate in professional practice, optimizing their work process, acting in the promotion of healthy habits, preventing health problems, and even in the management of material and human resources of nursing. Bringing nursing closer and closer to mobile technology, accessible to professionals, enabling quality care that allows the development of all its functions (Santos, et al. 2020)

Due to the complexity of the critical environment, technological mediation in educational activities has strengthened the process of dissemination of information inherent to processes, such as the prevention of HAIs. There are also expectations that scientific advances can improve the quality of care provided, increasingly minimizing adverse events resulting from hospital infections. In this scenario, studies on technological innovation are essential to meet the demands that emerge from changes in society (Melo et al. 2021).

The technological apparatus used in the ICU seems to give meaning to the care process in this environment and is a reference framework, in such a way that it has become impossible to think of these units without their presence and without the constant need for improvement and improvement. As a result, nursing was increasingly searching for new technical knowledge, associated with the theoretical foundation of scientific basis, which is extremely necessary for the development of its care activities. (Louro et al., 2012).

In this context, the virtual learning environment is an important tool for the realization of continuing education and the construction of knowledge can be increased by the union of teaching strategies that allow autonomy of the professional, the dialogic relationship and the deepening of the contents. It was proven that the development and implementation of a tool for continuing education stimulates the discussion of specific topics and debates in forums, as a means of promoting the evolution of scientific knowledge by the team involved. (Frutuoso et al, 2019).

The use of digital technologies and tools enables the optimization of infection prevention processes such as hand hygiene, one of the most effective ways to prevent healthcare-associated infections and reduce their transmission. Due to recent advances in sensing technologies, electronic hand hygiene monitoring systems have been integrated into the daily routines of healthcare professionals to measure the compliance and quality of hand hygiene, verifying, among other points, its effectiveness (WANG, et al., 2021).

This implies mentioning that technological tools are also responsible for optimizing accessibility during on-site observations, promoting faster feedback on compliance rates (Alvim & Couto, 2019).

The use of applications is very common among health services and supports the organization of data, enabling access to information in real time and/or remotely. It is worth mentioning that the methods for developing these technologies are complex, involving a mix of instructional, systematized, contextualized and user-centered design. In other words, the development of an App does not only involve the creation and availability for download on digital platforms. In this case, other complex methodological steps are needed to validate the use of technology (Alvim & Couto, 2019).

Although such methods/techniques still face problems of accuracy, data integration, privacy and confidentiality, usability, associated costs and infrastructure improvements, these produce a positive impact for the adapted nursing work environment. Technology in care aims at the intervention of procedures and the precision of use, which, in addition to optimizing time and reducing, resize the space for the nursing effort to become more efficient in actions. The main technological advances in the field of nursing are protected in patient care and are recommended for qualifying and protecting safe care. Providing advances related to productivity and quality of health service provision for the cure of diseases, cost reduction, and rapid improvement (Barreto & Cruz, 2021).

Thus, the importance of constant improvement in the work process in the critical environment is emphasized, as listed in the studies, bringing the need for greater awareness in this environment about the importance of using and building technological tools that optimize, among other things, the prevention of infection.

CONCLUSION

The present study, in view of the literature found and evidence presented, shows the importance of technologies in the critical environment regarding infection prevention, as well as the relevance of constant updating and construction of technologies that promote disease prevention and optimization in the work process.

At the end of this work, it is possible to understand the relevance of the role of nursing in the prevention of infection in the critical environment, as well as the operationalization and replication of the use of tools that bring greater awareness to the team about the implications of infection in critically ill patients, as well as the appropriate use of digital tools that allow it to prevent/minimize it.

The study presented as a limitation the small amount of construction of technological tools for infection prevention in a critical environment, bringing the need for greater discussion and awareness of the problem, as well as the search for solutions and innovations in the area by the academic-professional community.

REFERENCES

1. Alvim, A.A., & Couto, B. (2019). Hands Clean: Taxa automática para higienização das mãos - desenvolvimento de aplicativo para controle de infecção. *Enfermagem em Foco*, 10(3), 147-151. Disponível em: http://revista.cofen.gov.br/index.php/enfermagem/article/view/2121/568. Acesso em: 01/06/2022

2. Anima Educação. (2014). Manual revisão bibliográfica sistemática integrativa: a pesquisa baseada em evidências. Grupo Ănima Educação. Belo Horizonte, BH(BR): http://disciplinas.nucleoead.com.br/pdf/anima_tcc/gerais/manuais/manual_revisao.pdf

3. Barreto, V.A., & Cruz, I.C.F. (2021). Qual a melhor tecnologia digital para a intervenção de enfermagem em cuidados com ferida cirúrgica em UTI? *Journal of especialized nursing care*, 14(01). Recuperado de http://jsncare.uff.br/index.php/jsncare/article/view/3467/932.

4. Brasil. (2010). Ministério da Saúde. Política Nacional de Gestão de Tecnologias em Saúde. Brasília. Acesso em: 15/04/2022

5. Cardoso, E.C., et al. (2010). Perfil Das Infecções Relacionadas À Assistência À Saúde Em Uti Adulto Em Hospital Público De Referência Em Cardiologia, Belém - Pará. *Brazilian Journal of Health Review*, ISSN: 2595-6825.

6. Frutuoso, I.S., et al. (2019). Criação de um ambiente virtual de aprendizagem em terapia intensiva. *Rev. enferm. UFPE online*, 13(5), 1278-1287, maio.

7. Jorge, M.S.B., et al. (2022). Planejamento estratégico, ferramentas de gestão e tecnologias: implicações na saúde e tomada de decisões. Editora Amplla Campina Grande – PB – Brasil.

8. Louro, T.Q., et al. (2012). A terapia intensiva e as tecnologias como marca registrada. *Rev. Pesquisa (Univ. Fed. Estado Rio J., Online)*, 4(3), 2465-2482, jul.-set.

9. Mello, G.R.D., et al. (2018). Sepsiscare: avaliação de aplicativo móvel no cuidado de enfermagem ao paciente com sepse. *Cogitare Enferm.*, 23(2), e52283. https://www.redalyc.org/journal/4836/483655548004/483655548004.pdf. Acesso em: 01/06/2022

10. Melo, E.F., et al. (2021). Desenvolvimento de website para enfermagem em cuidados críticos sobre infecção relacionada à assistência à saúde. *Revista Brasileira de Enfermagem*, 74(supl.5), e20200928. Disponível em: https://pesquisa.bvsalud.org/portal/resource/pt/biblio-1251234. Acesso em: 01/06/2022

11. Mendes, K.S., et al. (2019). Use of the bibliographic reference manager in the selection of primary studies in integrative reviews. *Texto & Contexto - Enfermagem*, 28, 1-13.

12. Melnyk, B.M., & Fineout-Overholt, E. (2005). Making the case for evidence-based practice. In: Melnyk BM, Fineout-Overholt E. *Evidence-based practice in nursing & healthcare. A guide to best practice.* Philadelphia: Lippincot Williams & Wilkins;2005.p.3-24.

13. Pereira, F.G.F., et al. (2016). Caracterização das infecções relacionadas à assistência à saúde em uma Unidade de Terapia Intensiva. *Vigilância sanitária em debate*, p. 70-77.

14. Rocha, P.K. (2013). Cuidado e tecnologia em unidades de terapia intensiva. *Index Enferm vol.22 no.3 Granada jul./set*. Disponível em: https://dx.doi.org/10.4321/S1132-12962013000200009. Acesso em: 01/06/2022

15. Salomé, G.M., Rosa, G.C.M., & Rosa, J.I. (2021). Validação do aplicativo móvel asptraqueal para aspiração. *Rev. Enferm. Contemp.*, 11, e3982. Disponível em: http://dx.doi.org/10.17267/2317-3378rec.2022.e3982. Acesso em: 01/06/2022

16. Salvador, P.T.C.O., et al. (2015). Tecnologia no ensino de enfermagem. *Revista Baiana de Enfermagem*, Salvador, v. 29, n. 1, p. 33-41, jan./mar. Disponível em: https://periodicos.ufba.br/index.php/enfermagem/article/view/9883. Acesso em: 15/04/2022

17. Santos, A.H.S., et al. (2020). UTI Escore - protótipo de aplicativo para gestão da assistência de enfermagem. *Journal of Health Inform.*, 2020 Número Especial SBIS - Dezembro, 183-8.

18. Torres, I., et al. (2021). Indicadores de infeção relacionados com a assistência à saúde – Estudo de uma Unidade de Terapia Intensiva em Minas Gerais, Brasil. *Anais do IHMT*. Recuperado de https://anaisihmt.com/index.php/ihmt/article/view/373/310. Acesso em 15/04/2022

19. Viana, R.A.P.P., et al. (2020). Sepse: Um Problema de Saúde Pública -A atuação e colaboração da Enfermagem na rápida identificação e tratamento da doença. 3 ed. São Paulo: COREN-SP.

20. Wang, C., et al. (2021). Sistemas de Monitoramento Eletrônico para Higiene das Mãos: Revisão Sistemática da Tecnologia. *Journal Med Internet Res*, 23(11), e27880. doi: [10.2196/27880](10.2196/27880). Recuperado de https://pubmed.ncbi.nlm.nih.gov/34821565/

First Aid: A university-school interaction

https://doi.org/10.56238/sevened2024.005-022

Bruna Guedes Neves[1], Natan Fontoura Saratt da Silva[2], Bethânia Flach Antunes[3], Bruna Martins Garlet[4], Fernando Duarte Cassel[5] and Tiago Bittencourt de Oliveira[6]

ABSTRACT

Health promotion through education is an educational approach that enhances society's well-being and healthy lifestyle habits. The purpose of this project was to carry out educational actions in public and private high schools, visiting schools or receiving them in the Human Anatomy laboratories of the University. Weekly meetings were held for the study and training of volunteer scholarship holders of the Biomedicine, Nursing and Pharmacy courses, together with the teaching professors, scientific articles and face-to-face training with a professional rescuer from SAMU (Mobile Emergency Care Service) were used. After contact with the educational institutions, the practices were planned and designed in two schools, which were conducted in stations, lasting fifteen minutes for each topic, they were: CPA (cardiorespiratory arrest), approach to choking and drowning, management of fractures and dislocations, management of seizures, approach to hemorrhages, care for fainting and epistaxis and treatment of burns. The educational activities were well received by the students and teachers of the schools, who pointed out that the methodology was adequate (97.4% and 100%, respectively), met expectations (93.4% and 100%) and improved knowledge on the subject (92.1% and 60%, respectively). Therefore, health education actions in schools on first aid are fundamental, highlighting the request by the school on the subject and the use of models and anatomical pieces to represent in a practical way the simulation of first care in a health emergency.

Keywords: First Aid, Adolescence, Health Education, Health at School, Health Promotion.

[1] Student of the Pharmacy course at URI (Regional Integrated University of Alto Uruguai and Missions - Santo Ângelo Campus, RS).
E-mail: brunaneves20@icloud.com
[2] Nursing students at URI – Campus Santo Ângelo, RS.
E-mail: snatanfontoura@gmail.com
[3] Student of the Biomedicine course at URI – Campus Santo Ângelo, RS.
E-mail: beflacha@gmail.com
[4] Nursing students at URI – Campus Santo Ângelo, RS.
E-mail: brugarlet@outlook.com.br
[5] Professor, MSc in Biological Sciences (Anatomy) at URI – Campus Santo Ângelo, RS.
E-mail: fernandocassel@san.uri.br
[6] Professor, MSc in Biological Sciences (Anatomy) at URI – Campus Santo Ângelo, RS.
E-mail: tiagob@san.uri.br

INTRODUCTION

First aid can be classified as care to be provided immediately to victims of accidents or specific episodes (such as sudden illness, for example), in order to maintain the victim's vital functions until the arrival of qualified assistance (MELLO et al., 2023). For this, it is of paramount importance that lay people (who are not health professionals) are trained to recognize risk situations and initiate maneuvers that can give the patient survival (DA CRUZ et al., 2021).

In Brazil, in the age group of 01 to 15 years, accidents are the main cause of death, and, in the school environment, accidents are relatively frequent and cause concern for society (DA CRUZ et al., 2021). In addition, disseminating the study of first aid in the school environment brings great benefits. In this context, around the world, entities such as the European Resuscitation Council (ERC) and the American Heart Association (AHA) have produced training that targets the school public, making students become multipliers, taking information from school to their families (MELLO et al., 2023).

However, the deficient infrastructure in materials and anatomical parts in basic schools compromises the provision of excellent teaching (ARRUDA & SOUSA, 2014). This deficiency can be met through greater interaction between university and school, with visits to the University's Anatomy laboratory and visits with specific materials to the school, providing a practical and in-depth experience in the study of first aid care (MATURANA & COSTA, 2011). It also seeks to develop and implement the interaction between the university and the community to contribute to the academic training of students. The conception of the present work aims to offer a more qualified response of the university to the demands of the schools.

University extension enables an exchange of knowledge with the community, giving new meaning to popular knowledge (SCHEIDEMANTEL et al., 2004). In addition, Law No. 13,722, of October 4, 2018, makes training in basic notions of first aid mandatory for teachers and employees of public and private establishments, from basic education to children's recreation establishments because, in addition to being important to have first aid kits, it is essential to know how to use them properly (BRASIL, 2018). The work carried out contributes to the strengthening of integration between the community and academia, favoring the development of university and school students. Making the transformation of university extension from a unidirectional activity to a dialogical interaction with society (COELHO, 2015).

The project includes the participation of scholarship holders from the Biomedicine, Nursing and Pharmacy courses, together with professors, organizing meetings to promote interaction between schools in a municipality and the university. Therefore, the present work has as its general objective to contribute to the qualification of teaching in schools, providing teachers and students with the opportunity to exchange knowledge about first aid care in various situations, in addition to the

handling of models and anatomical pieces of the University to elucidate the theoretical part and make the practice more realistic.

METHODOLOGY

This is a descriptive exploratory field study with a qualitative-quantitative approach. The field of study comprised two basic education schools: one public and the other private, both in the city of Santo Ângelo, Rio Grande do Sul. The research subjects were students in the first and second years of high school.

The first action carried out was the dissemination of the project through contact with the municipal and state education coordinators of Santo Ângelo. Also, direct contact with private schools in the municipality.

After this, the contact with the schools aimed to define the theme to be developed and to establish the way in which the teachers in the schools and the students who participated in the meeting will act. At this point, the biology teacher was exposed to the topics we could address in the practical class at the university, and it could still be open to the discussion of other proposals suggested by the professors. Encouraging the teacher to initially work on this chosen theme in the classroom in a theoretical way, so that later there would be a practical explanation at the university. In this way, we seek to carry out a work that originates from the participants' desires.

The working group was organized in an interprofessional way, with 2 professors and scholarship holders from the courses of Biomedicine, Nursing and Pharmacy. For integration and presentation of various areas of knowledge. At the same time, the project's fellows met weekly for study groups and knowledge exchanges.

Thus, the contacted school requested the topic of first aid, encouraged by recent accidents. The fellows organized the subject into workshops, which we called workstations to receive the students. Each station lasted 15 minutes, with pre-defined themes, which were divided into seven: 1) cardiorespiratory arrest (CPA), 2) choking and drowning care techniques, 3) procedures for fractures and dislocations, 4) seizure management, 5) approach to hemorrhage (including shocks), 6) treatment of fainting and epistaxis, 7) treatment of burns and electric shock. The stations or workshops were prepared (structured) for practical activities with basic infrastructure material existing in the Anatomy and Pathology laboratory used at the university.

After the meetings, an evaluation instrument was used through a questionnaire to the participating teachers and students. The questionnaire had 8 questions for the teachers and 5 for the students, the first two being closed and the others open, they dealt with whether the time of the activity was adequate, the methodology was assertive, whether it had met the expectations, the quality of the material used and the integration with the disciplines in the school.

For the quantitative analysis, integers and percentages were used. For the qualitative analysis, a systematization through content analysis followed, at first the information collected was exhaustively read, then demarcated in its relevance, grouped into similar themes, analyzed and interpreted in the light of the theoretical frameworks.

RESULTS

During the month of September, meetings were held with the scholarship holders to discuss integration strategies with the schools and plan intervention activities. In the first two meetings with the professor of Anatomy and Pathology, the analysis of scientific articles was carried out for theoretical guidance of the activities.

At another time, the advisor teachers, together with one of the scholarship holders, visited the Tiradentes State School with the purpose of discussing and fine-tuning details of the integration with that institution. During this meeting, the terms of the meeting and the topics to be addressed in the context of first aid training were established. Therefore, the school management and the Biological Sciences teacher brought the importance of the first aid theme to inform and guide students on topics such as: fainting, cuts, fractures, electric shock, convulsions, choking, cardiorespiratory resuscitation and others. In the meantime, another school, now URI's private school, has also shown interest in carrying out the same activity.

In view of the above, as a form of improvement, the group made up of scholarship holders from the Biomedicine, Pharmacy and Nursing courses began their studies to carry out the activities. For this reason, a meeting was held for the training of students where they received instructions from a technical nursing professional linked to the Urgency and Emergency Services (SAMU) of the city and region, as shown in Figure 1. In which he addressed several important information about first aid, providing guidance for intervention in cases of choking, care at the accident site, management of fractures and mobilization of patients and, especially, cardiorespiratory resuscitation.

Figure 1. Group of fellows and teachers following the first aider's instructions on first aid, to then apply it in schools. On the right side, fellows simulating and practicing cardiac massage and using a defibrillator on the day of the orientations.

In the meantime, a meeting was organized in the university's nursing laboratory in order to define the division of the scholarship holders in relation to the topics requested. Thus, in order to effectively meet the demands of the institution, the scholarship holders made a presentation to the project's advisors, to polish the explanation with relevant complements to the themes. Thus, the techniques were tested with laboratory materials intended for practice, and some of this material included: fractured bones, anatomy models such as arteries and veins, back, hemihead, spine with hernia, vertebrae with osteophytes, dolls for better choking instruction in babies, training dummies for cardiorespiratory arrest, tourniquets and compression bands.

In this context, the students were instructed to teach the students of a school about the importance of remaining calm, paying attention to the possibility of other victims, including possible risks to oneself, preserving the safety of the area of the incident, performing techniques to assess vital signs, awareness and removal of the "curious".

Ten scholarship holders from different courses were gathered, three from the Nursing course, three from Biomedicine and four from Pharmacy students. Therefore, the group set up seven workstations with the themes, divided between two fellows at each station where it was organized to last 15 minutes. This activity took place at the school, with the university's support materials taken by the group. In view of this, a total of seventy-seven students from the first and second year of high school participated in this activity, being divided into groups of seven to ten students for each station, as shown in figure 2. Then, the students circulated through the seven stations set up to have the opportunity to participate in all the practices.

Figure 2. Workstations created with students at the Tiradentes school, the left group guidance on cardiorespiratory resuscitation, the right on seizures.

After completing the activities, the participating students and teachers filled out a questionnaire about their perspectives on the activities. The results obtained from the students' questionnaires are shown in Table 1 and the answers from the teachers' perspectives are shown in Table 2.

Question	Yes n (%)	No n (%)	Did not answer n(%)
Time was right	71 (93,4)	5 (6,6)	0 (0,0)
	74 (97,4)	1 (1,3)	0 (0,0)
Methodology was adequate	8 (10,5)	62 (81,6)	0 (0,0)
Material must be reviewed	71 (93,4)	1 (1,3)	3 (3,9)
Met expectations	70 (92,1)	3 (3,9)	3 (3,9)

Source: authors

Based on the questionnaire, the students were also asked if they had any suggestions. Most of the students answered that the evaluation was valid, and their suggestions included that they would like more stations, more content, more time, and used this space to leave their compliments, their acknowledgments of the importance of the contents. Some reported that "the activity was very knowledgeable", "good participation of the academics", "dynamic and didactic explanations". They

also suggested holding the event annually. Other students suggested the inclusion of more practices, would like it to be "more in-depth", included that "the information is crucial", that "the approach is didactic and fun", and evaluated the work with excellence. Thirteen students did not submit any suggestions.

Question	Yes n (%)	No n (%)	Did not answer n (%)
Time was right	4 (80,0)	0 (0,0)	1 (20,0)
Methodology was adequate	5 (100,0)	0 (0,0)	0 (0,0)
Met expectations	5 (100,0)	0 (0,0)	0 (0,0)
Evolved in knowledge	3 (60,0)	0 (0,0)	2 (40,0)
Your participation was important	5 (100,0)	0 (0,0)	0 (0,0)

Source: authors

With the teachers it was no different, they were asked if there were any suggestions where the 5 teachers did not answer. Questions were raised about what the action would be after the meeting, and as an answer we obtained 2 (40%) that a post-activity report would be prepared, 1 (20%) that opted for an observation questionnaire, 2 (40%) that refrained from offering a specific answer. In addition, in this question, it was asked if there could be integration with other disciplines and we obtained an affirmative answer, 3 (60%) answered yes and 2 (40%) answered that with the discipline of languages that could be integrated.

DISCUSSION

In the present study, the union of the theoretical part (use of a media projector, in some themes) and the use of real materials from the university – such as the anatomical dorsum for PCR simulation, bones and adhesive tapes for dislocation and hemorrhages, dummies for simulating seizures and burn models, for example – for the practical realization of the stations was extremely important to elucidate the maneuvers in a clear and objective way. bringing reality to the simulation. The main dynamic was to approach the topics around 15 minutes per station, in a clear, practical and objective way, which leads to greater attention on the part of the students.

Based on the above, FERNANDES CARDOSO et al. (2021) approach a similar technique, they developed an educational gymkhana for adolescents with a focus on first aid, proposing a questionnaire that was previously answered by 27 students, where 12 of them opted for a teaching

method that was more prone to interactive and dynamic practice, maintaining playful and active content, Uniting theory and practice.

On the other hand, in the study carried out by ALTINO FILHO et al. (2020), it is evident that the most used modality in schools is through lectures or expository classes. However, it is currently considered that the use of active methodologies, with practices and student participation, provides more effective results in the teaching-learning process (ALTINO FILHO et al., 2020).

In a quasi-experimental study of health education, carried out by SILVA et al. (2023), observed the importance of training teachers in daycare centers in a city. To this end, theoretical-practical activities were elaborated for the teachers, with the following themes: Foreign Body Airway Obstruction (OVACE), CRP and musculoskeletal trauma. The educational intervention was carried out with the application of pre- and post-activity questionnaires, where a significant improvement in the teachers' responses was observed, evaluating their performance at more than 90% effectiveness after the intervention (SILVA et al., 2023). However, our study focused on the orientation of students and had the active participation of teachers, where they were able to contribute with their knowledge so that the practice was not limited to replacing classes in schools.

Furthermore SILVA et al. (2022) conducted a survey with the aim of assessing lay people's knowledge about first aid in out-of-hospital settings. To this end, they developed a questionnaire addressing initial care, identification of vital signs, and procedures for contacting specialized emergency services. This questionnaire was answered by 150 people, in which the majority of participants (79%) indicated that the first measure to be taken when faced with an unconscious person would be to check vital signs, especially pulse (78%) and breathing (6.6%). Thus, most participants (84.5%) reported not feeling prepared, especially due to the lack of training and knowledge on the subject. Meanwhile, 46% of survey participants stated that, in case of accidents, the first specialized emergency service they would seek would be the SAMU (Mobile Emergency Care Service) (SILVA et al., 2022).

In addition, it is possible to intervene with strategies that favor the teaching of first aid in schools, such as the School Health Program (PSE). This program aims at the intersectoriality between health and education through the performance of the Family Health Strategy (FHS), promoting health and knowledge for the community through the professionals who compose it, therefore, the subject of first aid would be of great value to the PSE (GRIMALDI et al., 2020).

Another program that aims to raise awareness among the population is the "Samuzinho" project, carried out by the SAMU of the municipalities and, in addition to raising awareness, also trains children for emergency situations and problems caused by inappropriate calls to the emergency number 192 (GRIMALDI et al., 2020). With these strategies, it is possible to contribute to health education on the subject of first aid, both for teachers and students.

CONCLUSION

The fact that the themes were suggested by the schools themselves and the project's working group was able to meet this demand demonstrates an effective alignment with the needs and interests of the school community.

These positive results confirm the impact and relevance of the project, providing a solid foundation for the continuation and expansion of these activities in the future.

We articulated an evaluation method and the students and teachers gave their opinions. The general impressions of the opinions of the students and teachers reflect the recommendation for the periodic repetition of the event, followed by expressive thanks for the feedback received and for its organization.

REFERENCES

1. Altino Filho, H. V. et al. (2020). As metodologias ativas de aprendizagem: uma análise da percepção de futuros professores no curso de pedagogia. Pensar acadêmico, v. 18, n. 4, p. 850-860.

2. Arruda, R. M.; Sousa, C. R. A. (2014). Aproveitamento Teórico-Prático da Disciplina Anatomia Humana do Curso de Fisioterapia. Revista Brasileira de Educação Médica, v. 38, n. 1, p. 65-71.

3. Brasil. (2018). Lei N° 13.722, de 04 de outubro de 2018. Torna obrigatória a capacitação em noções básicas de primeiros socorros de professores e funcionários de estabelecimentos de ensino públicos e privados de educação básica e de estabelecimentos de recreação infantil. Brasília, DF: Diário Oficial da União.

4. Fernandes Cardoso, M. A. et al. (2021). Gincana educativa – como salvar uma vida: estratégia sobre primeiros socorros para adolescentes. Revista Ciência Plural, v. 7, n. 2, p. 16–32.

5. Coelho, G. C. (2015). O papel pedagógico da extensão universitária. Revista Em Extensão, Uberlândia, v. 13, n. 2, p. 11–24.

6. Da Cruz, K. B. et al. (2021). Intervenções de educação em saúde de primeiros socorros, no ambiente escolar: uma revisão integrativa. Enfermería Actual de Costa Rica, n. 40.

7. Freitas, M.P.B. et al. (2019). Anatomizando o corpo humano no processo de formação no ensino fundamental: uma experiência na perspectiva de graduandos de Enfermagem envolvidos na extensão universitária em saúde. Expressa Extensão; v. 24; n.3; p. 209-219, Set-Dez.

8. Grimaldi, M. R. M. et al. (2020). A escola como espaço para aprendizado sobre primeiros socorros. Rev Enferm UFSM, v. 10, p. 1-15.

9. Maturana, L. G. E; Costa, J. S. R. (2013). Anatomia humana como proposta prático-pedagógica para aplicar o tema transversal saúde na rede estadual de ensino de Diamantina – MG. Revista Vozes dos Vales da UFVJM: Publicações Acadêmicas – MG – Brasil – Nº 03 – Ano II – 05/2013 Reg.: 120.2.095–2011 – PROEXC/UFVJM – ISSN: 2238-6424.

10. Mello, K. C. et al. (2023). Metodologias educativas na aprendizagem de primeiros socorros em escolas:: Revisão de Escopo. REME-Revista Mineira de Enfermagem, v. 27.

11. Morin, E. (2005). A religação dos saberes: o desafio do século XXI; Bertrand Brasil, 5ª Ed. RJ.

12. Santos, J. W. et al. (2017). Metodologias de ensino aprendizagem em anatomia humana. Ensino em Revista, v.24, n.2, p. 364-386.

13. Scheidemantel, S. E.; Klein, R.; Teixeira, L. I. (2004). A importância da extensão universitária: o projeto construir. In: Anais do 2º Congresso Brasileiro de Extensão Universitária, Belo Horizonte.

14. Silva, C. H. et al. (2016). Conhecendo a Anatomia: A integração da Universidade com a educação básica. Itinerarius Reflectionis, v. 12, n. 2.

15. Silva, F. M. M. A. P. (2007). Da literatura, do corpo e do corpo na literatura: Derrida, Deleuze e monstros do Renascimento. Dissertação (Mestrado) – Universidade de Évora, Évora.

16. Silva, M. M. P. da et al. (2023). Intervenção educativa para professores de creches sobre primeiros socorros: estudo quase-experimental. Rev Enferm UFPI.

17. Silva, N. M. et al. (2022). Conhecimento de leigos sobre os primeiros socorros no ambiente extra-hospitalar. Nursing.

Transoperative nursing care in times of COVID-19: An experience report

https://doi.org/10.56238/sevened2024.005-023

Alana Freire Cisne[1], Antônia Rejânia Ávila[2], Débora Sousa Paiva[3], Diego Bruno Santos Pinheiro[4], Leidiane Maria da Silva de Paiva[5], Maria de Lourdes Santos Rocha[6], Maria Deluza Alves da Silva[7], Priscila Dias Pinto[8] and Fernanda Maria Gonçalves[9]

ABSTRACT

COVID-19 is a disease caused by the new Coronavirus that was identified in China in December 2019, soon after there was already a record of community transmission in Brazil, due to its high transmissibility, combined with the absence of recognized effective treatments. The Surgical Center (CC) is a hospital unit where anesthetic-surgical, diagnostic, and therapeutic procedures are performed, both elective and urgent and emergency. Surgical practices were directly affected because of the COVID-19 pandemic, with the need to suspend elective procedures and prioritize urgent and emergency procedures. In this context, planning to perform surgical procedures in a safer way, both for patients and for the team of professionals, has become a challenge and has been based on new protocols, specific checklists, and new practices for the prevention and control of SARS-CoV-2 transmission. The study aims to report the experience of transoperative nursing care for suspected or confirmed COVID-19 patients. This is an experience report on the planning and implementation of safety measures in transoperative nursing care for suspected or confirmed COVID-19 patients in a CC of a referral hospital in the North Zone of Ceará. Based on the care dynamics of the surgical unit, exclusive operating rooms (OR) were defined to perform surgical procedures in patients with suspected or confirmed cases of COVID-19, in compliance with ANVISA's recommendation, and other rooms for elective procedures that cannot be postponed The recruitment of professionals to compose the on-call staff due to the increase in care demand is highlighted. their training on care protocols and checklists used in suspected

[1] Specialist in Professional, Scientific and Technological Education. Graduated in Nursing.
Centec - Instituto Centro de Ensino Tecnológico
E-mail: freire.cisne28@gmail.com
[2] Graduated in Nursing; Urgency and Emergency Specialist
Institution: Centro Universitário Inta
E-mail: rejaniavila@gmail.com
[3] Graduated in Nursing; Specialist in Urgency and Emergency and in Strategic Health Management
Institution: Previdelli Clinic
E-mail: deborapaiva1801@hotmail.com
[4] Specialist in Urgency and Emergency; ICU and Hospital Management
Hospital Regional Norte
E-mail: diego.pinheiro90@gmail.com
[5] Bachelor of Business Administration
Santa Casa de Misericórdia de Sobral
E-mail: leidianedepaiva@gmail.com
[6] Nurse Practitioner, Obstetric Nurse Specialist
Institution: Centro Universitário Inta
E-mail: lurdinhaacd@hotmail.com
[7] Nurse Practitioner, Obstetric Nurse Specialist
Institution: Centro Universitário Inta
E-mail: deluzavasconcelos@hotmail.com
[8] Nurse, specialist in operating room and sterilization material center
Hospital Regional Norte
E-mail: pixilha@hotmail.com
[9] Nurse, Master's student in health management at UECE, specialist in Intensive Care Nursing
Salute Courses and Consulting
E-mail: nanda_nursing@hotmail.com

cases of Covid 19 is highlighted. To optimize the organization of the CC unit, information such as the signaling of suspected or confirmed cases of COVID-19 is now required to plan the logistics of patient care, including the exact amount of supplies, equipment, and instruments to be used. This information was included in the surgical notice, which consists of an instrument for communicating the procedure to the CC unit. The number of people in the OR was limited to the minimum team needed for the procedure and it was recommended that leftover surgical instruments and other reusable health products should be sent to the MSC in rigid containers, packed in milky white bags, identified as COVID-19. Subsequently, the tactical team of the sanitation and cleaning service, previously trained, should proceed with the terminal cleaning of the operating room, using the same product, standardized by the institution. It is considered that the elaboration, dissemination and implementation of the training of the protocol and checklist were essential and necessary for the adequacy of the health service. The construction of this new work process evidenced the importance of nurses in leadership, in the continuing education of teams, in the standardization and monitoring of work processes, and in coping with any and all adversities, especially in a surgical unit. Commitment, proactivity and collaborative actions were decisive for safe care, as well as for promoting adequate working conditions for all those involved in the process.

Keywords: Nursing, Transoperative, COVID-19.

INTRODUCTION

The SARS-CoV-2 coronavirus, of the Covid-19 subtype, was first recorded in the city of Wuhan, China, in 2019, whose first cases were confirmed in January 2020. It is a virus of the order Nidovirales, of the Coronaviridae family, highly pathogenic and responsible for causing respiratory and gastrointestinal syndrome (LI *et al*., 2020).

The rapid spread of Covid-19 has significantly affected people's lives and routines, both in daily hygiene behaviors such as the use of masks, hand washing with soap and water and application of hand sanitizer, as well as the social isolation of the population (OLIVEIRA; LUKE; IQUIAPAZA, 2020).

In the pandemic context, indirect transmission should be considered, as the virus is known to survive on different types of surfaces. Its viability can be influenced by the type of surface, ambient temperature, and relative humidity (MINISTRY OF HEALTH, 2020).

The Surgical Center (CC) is a hospital unit where anesthetic-surgical, diagnostic and therapeutic procedures are performed, both elective and urgent and emergency. Surgical practices were directly affected as a result of the COVID-19 pandemic, with the need to suspend elective procedures and prioritize urgent and emergency procedures, aiming to reserve beds for patients with respiratory infection (AGÊNCIA NACIONAL DE VIGILÂNCIA SANITÁRIA, 2020).

It is known that great challenges and limitations are found in managerial activities in operating room environments. This reality originates from conditions related to the work process itself, which is marked by unpredictability and the constant need for (re)planning and (re)organization of actions, in addition to the constant search for safety in the intraoperative period (MARTINS; DALL'AGNOL, 2016).

In this context, planning for the maintenance and resumption of surgical procedures in a safer way, both for patients and for the team of professionals, has become a challenge and has been based on new protocols, specific checklists, and practices for the prevention and control of SARS-CoV-2 transmission (AGÊNCIA NACIONAL DE VIGILÂNCIA SANITÁRIA, 2020).

Thus, in view of the need to care for patients with a confirmed or suspected diagnosis of COVID-19 in a surgical unit, the need arose to restructure and reorganize work logistics with planning and implementation of safety measures in the transoperative nursing care for suspected or confirmed COVID-19 patients, in a CC of a reference hospital in the North Zone of Ceará. Such actions consist of the systematization and detailed description of the processes of a unit that enables the standardization, reorganization of procedure techniques and provides greater safety for patients and collaborators involved in the process (PEREIRA, et al., 2017).

Gong et al. (2020) consider that in the context of the SARS-CoV-2 pandemic, a protocol should be implemented for patients who require surgery, addressing preoperative preparation,

intraoperative management, and postoperative surveillance, with a view to avoiding complications and ensuring the safety of patients and health staff. Thus, this study aims to report the experience of transoperative nursing care for suspected or confirmed COVID-19 patients.

METHODOLOGY

This is a descriptive study of the experience report type on the planning and implementation of safety measures in the transoperative nursing care of suspected or confirmed COVID-19 patients, in a CC of a reference hospital in the North Zone of Ceará, more specifically in the Northern Regional Hospital (HRN) It is the largest hospital in the interior of the Northeast Region, with more than 54 thousand square m² of built area, and is responsible for serving an estimated population of 1.6 million people, from the 55 municipalities that are part of the Northern macro-region of the State. Tertiary (attends to cases of medium and high complexity). It has 24-hour urgent and emergency care). It is a reference in pediatrics, thoracic surgeries, vascular surgeries and otorhinolaryngology (INSTITUTE OF HEALTH AND HOSPITAL MANAGEMENT, 2021).

For the construction of the Protocol and checklist, a literature review was carried out, based on institutional guidelines and standardizations, as well as recommendations established by the National Health Surveillance Agency (ANVISA) for adherence and adequacy of the best evidence for the local reality and pertinent in all stages of the intraoperative period. In this continuum, the document was evaluated and approved by the Hospital Infection Control Service (SCIH) and approved by the hospital's Quality Management, to which the CC unit is subordinate.

The checklist consisted of points such as: information such as the signaling of suspected or confirmed cases of COVID-19 for planning the logistics of patient care; verification of previous information so that the room contained only the exact amount of supplies, equipment and instruments to be used, guidance on dressing, undressing, use of PPE, comfort of instruments and cleaning of the room. This initial information was included in the surgical notice, which consists of an instrument for communicating the procedure to the CC unit.

RESULT AND DISCUSSION

The Covid-19 pandemic had a significant impact on health services, which required, among other strategies, the suspension of elective surgical procedures and the maintenance of only anesthetic-surgical procedures on an urgent and emergency basis, as one of the means of preventing the spread of the pathology in health institutions.

In Brazil, the pandemic has highlighted the importance of protocols and strategies for patient and multidisciplinary team safety. And, the need to implement these in care, especially in anesthetic-surgical interventions of patients with a confirmed or suspected diagnosis of Covid-19. It is

noteworthy that each stage of the surgical act requires specific attention and care to avoid contamination of professionals and other users of the health system.

In this sense, it is understood that it was necessary to build protocols, checklists and training for the work teams, which in this period were trained by nurses working in the CC, carried out during working hours with small fragmented groups and moments of discussion of doubts. The moment consisted of the recruitment of professionals to compose the on-call staff due to the increase in the demand for care and the absence of professionals who were at risk for COVID, due to age, comorbidities and pregnancy, for whom training was offered in a more intensive and individualized way in order to make them safer and more empowered to serve these clients.

Such conduct followed the recommendation of ANVISA, which established a Technical Note No. 04/20 guidelines for health services: prevention and control measures that should be adopted during the care of suspected or confirmed cases of infection by the new coronavirus, considering that health professionals were on the front line with regard to the fight, follow-up and treatment of cases, however, adequate training on the checklist to be implemented, safety protocols, as well as standard precautionary techniques, contact and aerosols for the execution of care and the use of personal protective equipment in an appropriate and safe manner with a view to maintaining their health (BRASIL, 2020).

Following the protocol and checklist adopted, the nurse in charge of the sector remained in the external area, which precedes the operating room, to guide the team on the step-by-step of dressing, which ensured adherence and implementation of appropriate techniques for contact and aerosol precaution and strengthened the training already offered. The surgical team was dressed using the following PPE: cap, waterproof apron, goggles, face shield, N95 mask and overlapping surgical mask, gloves with long cuffs, closed and waterproof shoes, with the possibility of disinfection, according to the recommendations of ANVISA (BRASIL, 2020).

Ti *et al.* (2020) states that the safety of professionals who work in CC, in the care of patients diagnosed with COVID-19, should be ensured through adequate training on contact precaution techniques and aerosols, dressing and undressing, as well as PPE. The authors also highlight the need to use a specific operating room, with negative pressure, to perform procedures with airway manipulation in suspected and contaminated patients, in order to ensure the safety of professionals, which was adopted in the service and scored as relevant in the care process in the check list.

According to Coimbra *et al.* (2020) the above is very important and should be adopted by the multidisciplinary team to care for patients diagnosed with Covid-19, in order to avoid contamination of the environment and dissemination of the disease. Based on the care dynamics of the surgical unit, exclusive operating rooms (OR) were defined for the performance of surgical procedures in patients with suspected or confirmed cases of COVID-19, in compliance with ANVISA's recommendation,

and other rooms for elective procedures that cannot be postponed, elements included in the checklist. It should be noted that for verification, only strictly necessary equipment, instruments, furniture and medicines were kept, in order to reduce the number of items that could be cleaned, disinfected and sterilized or that could be discarded later

It was also adopted in the protocol that, prior to the transport and arrival of the patient with suspected or confirmed COVID-19 at the SC, the nurse and surgical team would check the organization of the OR and the availability of all supplies, equipment and staff necessary to perform the surgery, using a checklist. In addition, the defined team should be properly dressed to receive it. A nursing professional was included in the routine with the responsibility of receiving the patient and accompanying him/her, conducting the medical records, slips and exams wrapped in plastic bags. At this time, the guidance on the use of surgical masks was reinforced, both for professionals (stretcher bearer and nursing) and for the patient (SOBECC-BRAZILIAN ASSOCIATION OF NURSES IN THE SURGICAL CENTER, ANESTHETIC RECOVERY AND MATERIAL AND STERILIZATION CENTER, 2020).

The removal of PPE by professionals was recommended to be carried out according to COFEN (2020), which should be implemented, sequentially, in this order: gloves, apron or gown, cap or cap, goggles or face shield, surgical mask and respiratory protection.

The guidance of Wong *et al. (*2020) was also adopted for the undressing of the team, regarding avoiding touching the face or face before hand hygiene and after performing a spray bath. According to the study by Cunha *et al.* (2020) the instruments and materials for surgical intervention, after being used, should be sent to the Materials and Sterilization Center inside large, sealed plastic boxes, properly identified, with writing that is easy for the team to see, in order to carry out the appropriate disinfection and subsequent sterilization processes, in order to ensure the safety of the team and other users.

In addition, the prohibition of the use of adornments and the entry of personal objects, which could be potential means of spreading the virus, was emphasized. The number of people in the OR was limited to the minimum team required for the procedure and it was recommended that the surgeries be performed by the most experienced surgeon, in order to reduce the operative time and, consequently, the exposure of all, with the change of team members during surgeries being restricted to emergency cases (Agência Nacional de Vigilância Sanitária, 2020). The availability of a nursing technician as support in the external area of the OR was routinely implemented in order to maintain compliance with the precautions provided, minimize the risk of contamination and exposure of the employees involved, as well as to provide essential materials, equipment and supplies not foreseen for the surgical act (CUNHA *et al*., 2020).

The process of continuing education at this institution and, more specifically, at the CC, has undergone changes since the pandemic, especially due to the prevention measures recommended by the Ministry of Health, combined with social distancing. To this end, the health professionals who work in the CC were divided into small groups, with training, initially face-to-face and then online, with available technologies with the objective of clarifying doubts and improving knowledge for self-care and patient care with safety and quality (ROSA *et al.,* 2020).

FINAL THOUGHTS

The elaboration and implementation of a protocol and checklist for the care of surgical patients, in the face of a public health emergency situation, presented a great challenge, especially due to the short period of time and the gaps in knowledge about SARS-CoV-2 at that time, but it provided a lot of learning, integration and strengthening of the sense of team.

The construction and experience of this new work process evidenced the importance of nurses in leadership, in the continuing education of teams, in the standardization and monitoring of work processes and in coping with any and all adversities, especially in a CC unit, in the search for biosafety measures for patients and health workers.

The commitment, proactivity, engagement and collaborative actions of the teams were decisive for the effective implementation of the np CC protocol and checklist and responses to its requirements. Therefore, it made it possible to continue, in a safer way, the surgical care to patients, as well as to promote adequate working conditions for all those involved in the care of these patients in this health institution. In addition, it reinforced the importance of care based on institutional protocols, which would allow the reduction of the risk of exposure to the virus

REFERENCES

1. Agência Nacional de Vigilância Sanitária - ANVISA. (2020). Orientações para serviços de saúde: medidas de prevenção e controle que devem ser adotadas durante a assistência aos casos suspeitos ou confirmados de infecção pelo novo coronavírus (SARS-CoV-2). ANVISA. [Online]. Disponível em: https://portaldeboaspraticas.iff.fiocruz.br/wp-content/uploads/2021/03/NOTA-TECNICA-GVIMS_GGTES_ANVISA-04_2020-25.02-para-o-site-1.pdf

2. Associação Brasileira de Enfermeiros de Centro Cirúrgico, SOBECC -. (2020). Recuperação Anestésica e Centro de Material e Esterilização. Recomendações relacionadas ao fluxo de atendimento para pacientes com suspeita ou infecção confirmada pelo COVID-19 em procedimentos cirúrgicos ou endoscópicos. Brasil. Recuperado de: http://www.coren-es.org.br/wp-content/uploads/2020/04/

3. Coimbra, R., et al. (2020). Eurepean Society of Trauma and Emergency Surgery (ESTES) recommendations for trauma and emergency surgery preparation during times of COVID-19 infection. *Eur J Trauma Emerg Surg*, 46, 505-10. https://doi.org/10.1007/s00068-020-01364-7

4. Cunha, A. G., et al. (2020). Como preparar o centro cirúrgico para pacientes COVID-19. *Rev Col Bras Cir.*, 47, e20202575. https://doi.org/10.1590/0100-6991e-20202575

5. Gong, Y., et al. (2020). Anesthesia Considerations and Infection Precautions for Trauma and Acute Care Cases During the COVID-19 Pandemic: Recommendations From a Task Force of the Chinese Society of Anesthesiology. *Anesthesia & Analgesia*, 131(2), 326-334.

6. Li, Q., et al. (2020). Early transmission dynamics in Wuhan, China, of novel coronavirus–infected pneumonia. *N Engl J Med*, 382(13), 1199-207. https://doi.org/10.1056/NEJMoa2001316

7. Martins FZ, Dall'Agnol CM. (2016). Centro cirúrgico: desafios e estratégias do enfermeiro nas atividades gerenciais. *Revista Gaúcha de Enfermagem*, 37(4), e56945. https://doi.org/10.1590/1983-1447.2016.04.56945

8. Ministério da Saúde. (2020). Recomendações de proteção aos trabalhadores dos serviços de saúde no atendimento de COVID-19 e outras síndromes gripais. Brasília: Ministério da Saúde. https://portalarquivos.saude.gov.br/images/pdf/2020/April/16/01-recomendacoes-deprotecao.pdf

9. Pereira LR, et al. (2017). Avaliação de procedimentos operacionais padrão implantados em um serviço de saúde. *Arquivos de Ciências da Saúde*, 24(4), 47-51. https://doi.org/10.17696/2318-3691.24.4.2017.840

10. Oliveira, A. C. de, Lucas, T. C., & Iquiapaza, R. A. (2020). O que a pandemia da Covid-19 tem nos ensinado sobre adoção de medidas de precaução? *Texto contexto-enferm.*, 29, e20200106.

https://doi.org/10.1590/1980-265x-tce-2020-0106

11. Rosa, J. S. da, et al. (2020). Ação educativa para atualização de agentes comunitários de saúde sobre SARS-COV-2/COVID-19. *Rev Enfer Atual in Derme*, e-020007. http://revistaenfermagematual.com.br/index.php/revista/article/view/777/681

12. Ti, L. K., et al. (2020). What we do when a COVID-19 patient needs an operation: operating room preparation and guidance. *Can J Anaesth.*, 67(6), 756-758. https://doi.org/10.1007/s12630-020-01617-4

13. Wong, J., et al. (2020). Preparing for a COVID-19 pandemic: a review of operating room outbreak response measures in a large tertiary hospital in Singapore. *Can J Anesth.*, 67, 732-45. https://doi.org/10.1007/s12630-020-01620-9

Implantation and implementation of the SAEP of obstetric patients in a reference hospital in the North Zone of Ceará: A case study

https://doi.org/10.56238/sevened2024.005-024

Alana Freire Cisne[1], Antônia Rejânia Ávila[2], Débora Sousa Paiva[3], Diego Bruno Santos Pinheiro[4], Leidiane Maria da Silva de Paiva[5], Maria de Lourdes Santos Rocha[6], Maria Deluza Alves da Silva[7], Priscila Dias Pinto[8] and Fernanda Maria Gonçalves[9]

ABSTRACT

The improvement of surgical techniques, innovation and technological development have increased the occurrence of cesarean deliveries in various parts of the world. In this scenario, the professional who works in the CCO is of fundamental importance in the safety of the perioperative process, assuming managerial and care functions. This study aims to describe the case study for the implementation of the SAEP of obstetric patients in a reference hospital in the North Zone of Ceará. This is a descriptive study, of the case study type. The study took place in the city of Sobral, located in the North Zone of Ceará, more specifically in the Surgical Center of the Northern Regional Hospital. Initially, a literature search was conducted on topics related to NCS, as well as the risks and complications in the peripartum period, aiming at the standardization of instruments, which are essential for NCS to be a reality in the nurses' care experience. Subsequently, possible diagnoses, interventions, and results were identified to collaborate with the implementation of the NCS stages aimed at hospitalized users in obstetric services who need surgical intervention. Several nursing diagnoses (ND) were listed with their respective interventions and results based on Wanda Horta's theory of basic human needs and guided by the NANDA I taxonomy (2021 to 2023). Data analysis was based on observation, the answers obtained, and the evaluation of the educational intervention carried out in the third stage of the study, based on pertinent literature. The implementation and training brought rich discussions and fruitful moments of exchange of experiences, evidencing the need for integration and dialogue among

[1] Specialist in Professional, Scientific and Technological Education. Graduated in Nursing.
Centec - Instituto Centro de Ensino Tecnológico
E-mail: freire.cisne28@gmail.com
[2] Graduated in Nursing; Urgency and Emergency Specialist
Institution: Centro Universitário Inta
E-mail: rejaniavila@gmail.com
[3] Graduated in Nursing; Specialist in Urgency and Emergency and in Strategic Health Management
Institution: Previdelli Clinic
E-mail: deborapaiva1801@hotmail.com
[4] Specialist in Urgency and Emergency; ICU and Hospital Management
Hospital Regional Norte
E-mail: diego.pinheiro90@gmail.com
[5] Bachelor of Business Administration
Santa Casa de Misericórdia de Sobral
E-mail: leidianedepaiva@gmail.com
[6] Nurse Practitioner, Obstetric Nurse Specialist
Institution: Centro Universitário Inta
E-mail: lurdinhaacd@hotmail.com
[7] Nurse Practitioner, Obstetric Nurse Specialist
Institution: Centro Universitário Inta
E-mail: deluzavasconcelos@hotmail.com
[8] Nurse, specialist in operating room and sterilization material center
Hospital Regional Norte
E-mail: pixilha@hotmail.com
[9] Nurse, Master's student in health management at UECE, specialist in Intensive Care Nursing
Salute Courses and Consulting
E-mail: nanda_nursing@hotmail.com

those involved in care: class entities, professionals, users and managers. In addition, they emphasized the information that professionals recognize the importance of using NP for the valorization and scientificity of the profession; however, they did not use it satisfactorily due to lack of scientific preparation and/or institutional administrative demands that are concomitantly delegated to clinical care. This study is limited by the gap found in its central theme and by the fact that it is an initial process of the use of APS in obstetric patients. However, it is relevant to show that the challenges and potentialities of the NP and SAEP in the CC are not only related to professional practice. But also, to the publications on the subject. It is hoped that the work developed here can be a driving force for future publications and in-depth research.

Keywords: Systematization of care, Nursing, Pregnant women.

INTRODUCTION

The improvement of surgical techniques, innovation and technological development have increased the occurrence of cesarean deliveries in various parts of the world. This evolution has led to cesarean section becoming one of the most widespread surgeries, however, as all surgical interventions have risks, among these, the ones that stand out the most are hemorrhage, postpartum infection and anesthesia complications, in addition to a higher probability of complications due to the number of cesarean deliveries (Boeckmann & Rodrigues, 2015)

In Brazil, there are about three million births annually, most of them through cesarean sections. The use of this surgical procedure has increased in the country, since in 1994 the national rate was 32% and in 2010 it reached 52% of all deliveries (Silva; Olive tree; Prado, 2019)

In this scenario, the professional who works in the OCC is of fundamental importance in the safety of the perioperative process, assuming managerial and care functions (Soares et al., 2015). Managerial functions involve forecasting and sourcing materials and supervising the technical team (Martins & Dall'agnol, 2016). As for care activities, they should be based on the Systematization of Nursing Care (NCS), which is part of the Nursing Process. In the perioperative context, it is called Systematization of Perioperative Nursing Care (SAEP).

The NCS follows Resolution 358/2009 of the Federal Council of Nursing, and has five interdependent and interrelated stages that underlie nursing care: 1-Nursing History, 2-Nursing Diagnosis, 3-Planning, 4-Implementation, and 5-Evaluation. Its implementation should be carried out in all environments where there is nursing care. However, this practice is incipient and sometimes occurs in a fragmented way (Santos et al., 2014).

The Perioperative Nursing Care System (SAEP) represents the methodology used to achieve the professional goals of UCC nurses, within their area of expertise, comprising the following steps: 1-Preoperative evaluation; 2-Identification of problems; 3-Nursing care planning; 4-Implementation of nursing care and 5-Postoperative evaluation (Carvalho et al., 2014)

This instrument should contain individual patient information, with identification data, anamnesis, physical examination, nursing care needs (nursing diagnoses), as well as interventions and evaluation of the care offered. The SAEP aims to ensure planned care, focusing on all operative periods (perioperative), that is, from the preoperative period (where the patient is informed that he will need to undergo a surgical procedure and hospitalized in a bed), intraoperative (surgery itself) and postoperative, where the patient has already undergone surgery, but may present complications. Due to its importance, in the year 2000, the Systematization of Nursing Care became a requirement of the Federal Council of Nursing (SOBECC, 2021)

This study is justified because it provides an opportunity to optimize the care and safety of obstetric patients in CHD, since it helps in the early identification of complications such as

hemorrhages, as well as to sensitize nurses about the importance of implementing the NCS by exploring the scientific evidence on nursing care for pregnant women in the OCC instrumentalized by the NP, contributing to the management of care. fostering the translation of knowledge.

From this perspective, this study aims to describe the case study for the implementation of the SAEP of obstetric patients in a reference hospital in the North Zone of Ceará.

METHODOLOGY

This is a descriptive study, of the case study type. A case study is a description and analysis, as detailed as possible, of a case that presents some particularity that makes it special. Under the heading EC are included many studies that form a range of varieties (Pereira et al., 2018).

The study took place in the city of Sobral, located in the North Zone of Ceará, more specifically in the Surgical Center of the Northern Regional Hospital (HRN). The HRN is the largest hospital in the interior of the Northeast Region, with more than 54 thousand square m² of built area, and is responsible for serving an estimated population of 1.6 million people, from the 55 municipalities that are part of the North macro-region of the State. Tertiary (attends to cases of medium and high complexity). It has 24-hour urgent and emergency care). It is a reference in pediatrics, thoracic surgeries, vascular surgeries, and otorhinolaryngology (Institute of Health and Hospital Management, 2021).

Initially, a literature search was conducted on topics related to NCS, as well as the risks and complications in the peripartum period, aiming at the standardization of instruments, which are essential for NCS to be a reality in the nurses' care experience. Subsequently, possible diagnoses, interventions, and results were identified to collaborate with the implementation of the NCS stages aimed at hospitalized users in obstetric services who need surgical intervention. Several nursing diagnoses (ND) were listed with their respective interventions and results based on Wanda Horta's theory of basic human needs and guided by the NANDA I taxonomy (2021 to 2023). Among the NDs defined, the following stand out: anxiety, risk of infection, risk of bleeding, risk of hypothermia, risk of impaired skin integrity, impaired sleep and rest.

Among other data that made up the instrument were: identification of comorbidities, signs of risk for obstetric hemorrhage, previous obstetric history, allergies, skin conditions, level of consciousness, type of breathing, and appearance of the abomimen. Blood pressure values, urine output, laboratory tests, among others.

Data analysis was based on observation, the answers obtained, and the evaluation of the educational intervention carried out in the third stage of the study, based on pertinent literature.

At the end of the construction of the material, it was presented to the senior management and quality management, after approval of the services mentioned, training and presentation of the

instrument to the team was initiated, it was carried out by the coordination of the Surgical Center service and a group of nurses from the service. during the shift schedule in teams formed by small groups that took turns among themselves so as not to disturb the progress of the service.

RESULTS AND DISCUSSION

The work of nurses in the Surgical Center is developed in the areas of care and administration, with the perspective of equipping the sector with the best conditions of patient care and work for the surgical team, in order to offer better means for the development of a safe surgical procedure. It is in the operating room that the fear of dying, fear of losing the child and the fear of pain intensify in women, and can dominate this experience in a negative way, especially when associated with other feelings or factors such as stress, anxiety, fatigue, tension, cold, hunger, strange environment, social and affective helplessness, reinforcing once again the importance of using SAEP (Silva; Olive tree; Prado, 2019).

During the training and presentation of the new instrument, the team was also presented with the reason for its construction, in this case the early identification of complications in pregnant women, the professionals were not only able to ask questions on the subject, but also to share their anxieties and fears in the face of the worsening of these patients. Initially, the group showed apprehension about the change in the routine of care for pregnant women, but during the course of the activities, informal conversations and relaxation of the participants took place. At this moment, doubts were clarified, at which time one of the participants expressed insecurity related to the changes that the research would cause. It was suggested to the participants to read texts, manuals and instruments of Perioperative Nursing.

Unanimously, the professionals mentioned that it would be very feasible to implement the instrument and that they would do it without problems and/or obstacles. In this sense, the SAEP was identified as an additional stimulus to the participation of nurses throughout the operative period, who should use critical thinking and scientific knowledge to plan their care, evidencing their autonomy and favoring professional recognition, aiming at surgical safety for pregnant women, parturients and newborns as a final result.

The receptivity of professionals is considered positive, because in order to strengthen the professional identity of nursing, it is necessary to understand the significant elements of the NP and the NCS, considering their potentialities and difficulties so that their full implementation is viable, this is the inference of the study (Gutiérrez & Morais, 2017).

The implementation and training brought rich discussions and fruitful moments of exchange of experiences, evidencing the need for integration and dialogue among those involved in care: professional associations, professionals, users and managers. In addition, they emphasized the

information that professionals recognize the importance of using NP for the valorization and scientificity of the profession; however, they did not use it satisfactorily due to lack of scientific preparation and/or institutional administrative demands that are concomitantly delegated to clinical care.

Soares et al. (2015) state that the biases for the consolidation of NCS can be mitigated with the improvement of services through institutional support in the provision of concrete conditions that facilitate its operationalization, such as: institution of protocols, adequate dimensioning of human resources, training of professionals and offer of standardized forms. It is also relevant to highlight the role of educational institutions in fostering the application of NP, sensitizing future professionals to the existence of these challenges and making them think critically about strategies to overcome them (Souza; Valencia; Parra, 2015).

When developing systematization in the perioperative period, nursing develops several functions related to the surgical experience, an example happens in the preoperative period, where the patient is vulnerable, both physically and psychologically, because it is at this moment that the SAEP aims to guide as to what is necessary to perform the surgery, favors the demystification of taboos that usually occur, and preparation for surgical intervention (Ascari, 2014)

The role of nursing is of undeniable relevance in the care of pregnant/puerperal women, a study conducted by Terto et al. (2021), says that hospitalization and early procedures of pregnant women cause unnecessary obstetric interventions that culminate in the indication of cesarean section. In this context, surgical nursing care emerges, which involves everything from clinical management to the execution of educational activities (Vicente et al., 2021). Through the use of SAEP, this care is offered in an individualized way, providing comprehensive and problem-solving care, although it is not always possible to use it (Ribeiro; Ferraz; Duran, 2017). It is emphasized that the use of systematization of care in the surgical environment provides patient safety, accuracy of records and facilitates communication among the team, making it possible to gradually and comprehensively monitor patients (Lopes; Gaspariny; Koller, 2015).

The use of SAEP helps nursing care to be focused on preventing complications and minimizing sequelae, aiming to reduce hospitalization time, improve self-confidence and treatment adherence, in addition to pre-, intra and post-surgical care (Gonçalves, et. al., 2021). On the other hand, the interaction of nursing care provided during SAEP provides the patient with a faster and more effective recovery, through quality care, provided in a comprehensive and specific manner at all times of the perioperative period, which certainly influences the success of the patient's surgical treatment (Araújo et al., 2021).

The preoperative nursing visit is the starting point of the SAEP. This procedure is essential for the physical and emotional preparation of the patient. During this visit, data for the history are

collected, needs/problems are identified, nursing diagnoses are elaborated, and prescriptions for the immediate preoperative and transoperative periods are elaborated, which facilitate postoperative care. The next phase of SAEP is the care of the patient in the intraoperative period, that is, the period that comprises the reception of the patient in the operating room, until the patient is referred to the post-anesthetic recovery room. The last phase of the systematization of perioperative nursing care is the postoperative period, and the nursing team needs to be prepared for possible complications that may occur to the patient during this period (Borges, 2016).

The SAEP enables the systematization of nursing care in compliance with the resolution of its class council, COFEN resolution 358/2009, as well as meeting the 2nd Global Challenge of the WHO and the Brazilian Ministry of Health for the safety of surgical patients (Araújo et al. 2022). In addition, it enables evidence-based and scientific-based care, highlighting the role of nurses in improving the quality of nursing care for surgical patients.

This study is limited by the gap found in its central theme and by the fact that it is an initial process of the use of APS in obstetric patients. It is worth mentioning the adherence and total interest of the professionals in contributing to the improvement of care, which is significant for the assimilation of the action carried out with them on the SAEP. In addition, the contact with clinical nurses enabled the mutual exchange of knowledge and experiences.

FINAL THOUGHTS

It is important to know and apply the nursing process in the perioperative period, based on the theory and scientific knowledge that is offered to nurses. The SAEP provides nurses with autonomy in the care of surgical patients, in order to offer continuous quality to them.

The implementation of the SAEP was analyzed as satisfactory by the nursing team and hospital management, and was defined as easy to interpret and complete. It is emphasized that, with the use of the SAEP, the aim is to improve surgical safety and systematized nursing care, enabling the performance of a practice based on scientific evidence based on the care of the class council (COFEN) and the World Health Organization (WHO) for a safe surgical practice for the mother-child binomial.

As a result, the importance of raising professionals' awareness of the familiarization and use of this resource that has been proven to be beneficial and effective for patient care throughout the perioperative period is reinforced, so that it enables the individualization and directing of care to biopsychosocial demands.

This study is limited by the gap found in its central theme and by the fact that it is an initial process of the use of APS in obstetric patients. However, it is relevant to show that the challenges and potentialities of the NP and SAEP in the CC are not only related to professional practice. But also, to

the publications on the subject. It is hoped that the work developed here can be a driving force for future publications and in-depth research.

REFERENCES

1. Araújo, K.B., et al. (2022). Sistematização da assistência de enfermagem à gestante no centro cirúrgico obstétrico: potencialidades e desafios. *Research, Society and Development*, 11(1), e14111125034. [CC BY 4.0] | ISSN 2525-3409.

2. Ascari, R.A. (2014). Reflexão Sobre o Cuidado Dispensado ao Paciente Cirúrgico no Perioperatório. *UNINGÁ Rev.*, 19(2).

3. Boeckmann, L.M.M., & Rodrigues, M.C.S. (2015). Segurança Cirúrgica na Cesárea: Revisão Integrativa. *Cogitare Enfermagem*, 20(4), 758-766.

4. Borges, I.T. (2016). Humanização da assistência de enfermagem perioperatório na cesariana. Monografia apresentada ao curso de Graduação em Enfermagem da Faculdade de Educação e Meio Ambiente. Recuperado de http://repositorio.faema.edu.br:8000/jspui/handle/123456789/870.

5. Carvalho, L.K.C.A.A., et al. Análise dos procedimentos realizados pela equipe de enfermagem na recepção dos pacientes no centro cirúrgico. *R. Interd.*, 7(4), 30-38.

6. Gonçalves, M.H.R.B., et al. (2021). Percepção dos enfermeiros do interior do Ceará acerca da SAEP. *São Paulo: Rev Recien.*, 11(33), 342-349.

7. Gutiérrez, M.G.R., & Morais, S.C.R.V. (2017). Sistematização da assistência de enfermagem e a formação da identidade profissional. *Revista Brasileira de Enfermagem*, 70(2), 436-441.

8. Instituto de Saúde e Gestão Hospitalar. (2021). Unidade Hospitalar Hospital Regional Norte. Recuperado de https://www.isgh.org.br/onde-estamos/hospital-regional-norte.

9. Lopes, N.P., Gaspariny, C., & Koller, F.J. (2015). A importância da assistência de enfermagem perioperatória como principal mecanismo de atuação do enfermeiro com foco na fase pré-operatória. *REVENF*, 4.

10. Machado, J.A.M., et al. (2021). Parto cesáreo humanizado: desafio dos profissionais de enfermagem. *Saúde, Meio Ambiente e Tecnologia no cuidado Interdisciplinar*. Recuperado de https://portal.epitaya.com.br/index.php/ebooks/article/view/161/110.

11. Martins, F.Z., & Dall'agno, L.C.M. (2016). Centro cirúrgico: desafios e estratégias do enfermeiro nas atividades gerenciais. *Revista Gaúcha de Enfermagem*, 37(4), e56945.

12. Pereira, A.S., et al. (2018). Metodologia da pesquisa científica. [free e-book]. Santa Maria/RS. Ed. UAB/NTE/UFSM.

13. Ribeiro, E., Ferraz, K.M.C., & Duran, E.C.M. (2017). Atitudes dos enfermeiros de centro cirúrgico diante da sistematização da assistência de enfermagem perioperatória. *Revista SOBECC*, 22(4), 201-207.

14. Santos, W.N. (2014). Sistematização da Assistência de Enfermagem: o contexto histórico, o processo e obstáculos da implantação. *JMPHC | Journal of Management & Primary Health Care*, 5(2), 153–158.

15. Silva, T.M., Oliveira, N.S., & Prado, P.R. (2019). Cirurgias seguras: instrumento de enfermagem obstétrica perioperatória. *SAJEBTT*, 6(1), 607-616.

16. Soares, M.I., et al. (2015). Sistematização da assistência de enfermagem: facilidades e desafios do enfermeiro na gerência da assistência. *Escola Anna Nery*, 19(1), 47-53. https://doi.org/10.5935/1414-8145.20150007.

17. Souza, L.P., Vasconcelos, C., & Parra, V. (2015). Processo de enfermagem: dificuldades enfrentadas pelos enfermeiros de um hospital público de grande porte na Amazônia, Brasil. *Brazilian journal of surgery and clinical research/BJSCR*, 10(1), 05-20.

18. SOBECC. (2021). Práticas recomendadas SOBECC/ Sociedade Brasileira de Centro Cirúrgico, Recuperação Anestésica e Centro de Material e Esterilização. 8ª Ed. São Paulo.

19. Terto, R.L., et al. (2021). Associação entre internação precoce de gestantes e uso de intervenções obstétricas e cesarianas: estudo transversal. *Rev Bras Enferm*, 74(4), e20200397.

20. Vicente, C., et al. (2021). Associação entre internação precoce de gestantes e uso de intervenções obstétricas e cesarianas: estudo transversal. *Cogitare enferm*, 26, e72640.

Cannabidiol in medicine: Indications, efficacy and clinical considerations

https://doi.org/10.56238/sevened2024.005-025

Aline Neves Viana, Ana Carolina Fermino, Francihellen Dantas Rego Guida, Guilherme Marroques Noleto, Isadora Cardoso Alves Propercio, Jessica Thaísa Lopes Soares, Leonel Carmo Rodrigues, Ludmila Mendes Ferreira, Rebecca Padilha Santos, Roberto Araújo de Oliveira Filho, Bárbara Barreira Carvalho and Giovana Sousa Ribeiro

ABSTRACT

Cannabidiol (CBD), a component of Cannabis sativa, has been studied for its therapeutic properties in several medical conditions. Clinical indications include the treatment of refractory epilepsies, anxiety disorders, chronic pain of neuropathic or inflammatory origin, sleep disorders such as insomnia, and neurodegenerative diseases such as Parkinson's disease and Alzheimer's disease. The use of CBD is considered when other therapeutic options fail, in patients intolerant to the adverse effects of conventional medications, or as an adjuvant therapy to enhance the effectiveness of other treatments.

Keywords: Cannabidiol, CBD, Cannabis.

INTRODUCTION

The use of Cannabidiol (CBD) in medical practice has been the subject of increasing interest due to its therapeutic properties in various clinical conditions. CBD, one of the compounds derived from the Cannabis sativa plant, has demonstrated efficacy in various medical indications, ranging from the treatment of refractory epilepsies to the management of anxiety disorders and chronic pain of neuropathic or inflammatory etiology. In addition, its potential applicability extends to sleep disorders, such as insomnia, and neurodegenerative diseases, including Parkinson's disease and Alzheimer's disease. Among the main clinical indications of CBD, the treatment of refractory epilepsies stands out, especially in pediatric patients with severe epileptic syndromes such as Dravet syndrome and Lennox-Gastaut syndrome. In addition, CBD has been studied and used in the management of anxiety disorders such as generalized anxiety disorder (GAD), post-traumatic stress disorder (PTSD), and panic disorder.

Another area of great interest is the use of CBD in the management of chronic pain, especially that of neuropathic origin or associated with inflammatory conditions such as rheumatoid arthritis and fibromyalgia. Studies suggest that CBD has analgesic and anti-inflammatory properties, and may be an important therapeutic option for patients who do not respond adequately to other treatment modalities.

In addition, CBD has been investigated as a possible adjunctive therapy in neurodegenerative diseases such as Parkinson's disease and Alzheimer's disease. Although still in the preliminary study phase, some evidence suggests that CBD may have neuroprotective and anti-inflammatory effects, and may play a role in reducing the progression of these diseases and improving the quality of life of affected patients.

However, it is important to point out that the use of CBD in clinical practice requires a cautious approach and supervision by qualified healthcare professionals. Considerations such as proper dosage, potential drug interactions, and monitoring of adverse effects are key to ensuring the safety and efficacy of CBD treatment. In addition, regular follow-up is required to assess the patient's response and adjust the treatment plan as needed.

METHODOLOGY

The research was developed and based on the reading and analysis of scientific articles, obtained from the databases: PUBMED, MEDLINE and SciELO, where publications related to the theme were selected, without geographical restriction. The search took place from March 25 to April 1, 2024, using the Descriptors in Sciences and Health (DeCS): "Cannabis" and "Cannabidiol";

RESULTS AND DISCUSSIONS

Growing research on Cannabidiol (CBD) has revealed a wide range of therapeutic applications in various areas of medicine. One of the most notable fields is the treatment of refractory epilepsies, where CBD has demonstrated efficacy in controlling seizures, especially in children with syndromes such as Dravet syndrome and Lennox-Gastaut syndrome. Mechanically, CBD appears to exert its anticonvulsant effects through the modulation of CB1 and CB2 cannabinoid receptors, as well as interacting with neurotransmitters such as glutamate and GABA. Additionally, CBD has been investigated as a therapeutic alternative for anxiety disorders such as generalized anxiety disorder (GAD), post-traumatic stress disorder (PTSD), and panic disorder. Proposed mechanisms include its action on 5-HT1A serotonergic receptors and endocannabinoid system pathways, resulting in anxiolytic and antidepressant effects that may be beneficial for patients who do not respond adequately to conventional treatments. When it comes to pain control, CBD has excelled in the treatment of chronic pain of neuropathic or inflammatory origin. Its analgesic and anti-inflammatory capacity is attributed to the inhibition of neuronal activity through the activation of TRPV1 and TRPA1 receptors, as well as the reduction of the release of pro-inflammatory cytokines. This makes CBD a promising therapeutic option for patients suffering from conditions such as rheumatoid arthritis, fibromyalgia, and other persistent pain.

Regarding neurodegenerative diseases such as Parkinson's disease and Alzheimer's disease, CBD has sparked interest due to its neuroprotective potential. Early studies suggest that CBD may reduce neuroinflammation, modulate neuronal apoptosis, and protect against oxidative stress, thereby contributing to the preservation of brain function and delaying the progression of these debilitating conditions. However, it is important to point out that despite the potential benefits, the use of CBD in clinical practice requires a careful and individualized approach. Considerations such as proper dosage, potential drug interactions, and monitoring of adverse effects such as drowsiness and gastrointestinal changes are key to ensuring the safety and efficacy of CBD treatment. In addition, regular follow-up of patients is necessary to assess the response to treatment and adjust the therapeutic plan as needed, thus maximizing the therapeutic benefits of CBD in modern medicine.

FINAL THOUGHTS

Cannabidiol (CBD) represents an important addition to the therapeutic arsenal in medicine, demonstrating efficacy in a variety of clinical conditions ranging from refractory epilepsies to anxiety disorders, chronic pain, and neurodegenerative diseases. Its multifaceted mechanisms of action, which include receptor modulation, neurotransmitter interactions, and anti-inflammatory and neuroprotective properties, contribute to its therapeutic versatility.

In summary, Cannabidiol (CBD) offers a new perspective on contemporary medicine, providing significant therapeutic benefits in various medical conditions. With a thoughtful approach and a solid foundation of scientific evidence, CBD has the potential to improve the quality of life for many patients and break new ground in the field of evidence-based medicine and clinical research. Its therapeutic versatility, coupled with the growing understanding of its mechanisms of action, highlights its importance as a valuable therapeutic option, which can offer effective solutions to complex clinical challenges. By continuing to explore its potential and enhance its clinical use, we can move towards an era of more personalized and effective medicine, benefiting the health and well-being of individuals around the world.

REFERENCES

1. Devinsky, O., Orrin, et al. (2016). Cannabidiol in patients with treatment-resistant epilepsy: an open-label interventional trial. *The Lancet Neurology, 15*(3), 270-278.

2. Blessing, E. M., et al. (2015). Cannabidiol as a potential treatment for anxiety disorders. *Neurotherapeutics, 12*(4), 825-836.

3. Russo, E. B. (2008). Cannabinoids in the management of difficult to treat pain. *Therapeutics and Clinical Risk Management, 4*(1), 245-259.

4. Fernández-Ruiz, J., et al. (2013). Cannabidiol for neurodegenerative disorders: important new clinical applications for this phytocannabinoid? *British Journal of Clinical Pharmacology, 75*(2), 323-333.

5. Crippa, J. A. S., et al. (2014). Cannabidiol for the treatment of anxiety disorders: A review of Brazilian clinical studies. *Revista Brasileira de Psiquiatria, 36*(1), 104-110.

6. Guimarães, F. S., et al. (2012). Cannabidiol: a new option for the treatment of anxiety. *Revista de Psiquiatria do Rio Grande do Sul, 34*(2), 6-7.

7. Zuardi, A. W., et al. (2015). Cannabidiol for the treatment of drug-resistant epilepsy in children: an open-label trial. *Revista Brasileira de Psiquiatria, 37*(3), 264-270.

8. Mello Schier, A. R., et al. (2014). Antidepressant-like and anxiolytic-like effects of cannabidiol: a chemical compound of Cannabis sativa. *CNS & Neurological Disorders-Drug Targets (Formerly Current Drug Targets-CNS & Neurological Disorders), 13*(6), 953-960.

9. Mechoulam, R., et al. (2008). Cannabidiol in medicine: a review of its therapeutic potential in CNS disorders. *Neuropsychiatric Disease and Treatment, 4*(1), 745-758.

10. Bergamaschi, M. M., et al. (2011). Safety and side effects of cannabidiol, a Cannabis sativa constituent. *Current Drug Safety, 6*(4), 237-249.

11. Campos, A. C., et al. (2010). Inhibition of experimental autoimmune encephalomyelitis by cannabinoids. *Neuropharmacology, 58*(7), 1400-1407.

The impact of new technologies on medical education

https://doi.org/10.56238/sevened2024.005-026

Marcos Antonio da Silva[1] and Márcio Hideki Setogutti Nanamura[2]

ABSTRACT

Medical education is undergoing a silent revolution, driven by the advancement of new technologies. As medicine evolves, so does the way future doctors are prepared to meet the challenges of the healthcare industry. In this article, we will explore the new technologies that are transforming medical education and their possible impacts on the quality of health care. The methodology used was an exploratory study of a qualitative nature, through bibliographic research, which was carried out from the literature review and the theoretical framework on the theme addressed.

Keywords: New technologies, Curriculum, Medical education.

[1] Master's degree in Urban and Regional Planning from the University of Vale do Paraíba (UNIVAP) and Doctoral student in Education: Curriculum at PUC-SP - Pontifical Catholic University of São Paulo.
Institution: Pontifical Catholic University of São Paulo – PUC-SP - Monte Alegre campus
E-mail: eescolaplanejamento@gmail.com
[2] Master in Education in Health Professions (PUC-SP) and Doctoral student in Education: Curriculum at PUC-SP - Pontifical Catholic University of São Paulo.
Institution: Pontifical Catholic University of São Paulo – PUC-SP - Sorocaba campus
E-mail: mnamura@pucsp.br

INTRODUCTION

Medical education is undergoing a quiet revolution, driven by the advancement of new technologies. As medicine evolves, so does the way future doctors are prepared to meet the challenges of the healthcare industry. In this article, we will explore the new technologies that are transforming medical education and their impact on the quality of health care. At the epicenter of this change is the growing influence of new technologies, which have the potential to revolutionize medical education in ways that were previously unimaginable.

It is notorious how new technologies are redefining the traditional paradigm of medical education. From virtual reality (VR), Augmented Reality (AR), to Artificial Intelligence (AI), Telemedicine, Virtual Patient Simulations to the availability of globalized online resources, technological tools are becoming key allies in shaping the next generation of doctors.

The present research has its genesis in the Graduate Program in Education: Curriculum in the New Technologies in Education Research Line of the Pontifical Catholic University of São Paulo (PUC-SP).

METHODOLOGY

This is an exploratory qualitative study, carried out through bibliographic research, which sought to investigate how new technologies are transforming medical education and its possible impacts on the quality of health care. Steps followed:

LITERATURE REVIEW

First, from August to October 2022, a bibliographic survey was carried out, which consisted of reviewing the literature related to the topic addressed. Books, periodicals, articles, Internet sites, among other sources, were used. In order to delimit the research on medical education, the research was concentrated in the following databases: Latin American and Caribbean Health Sciences Literature - LILACS; PubMed, Scielo Brasil *Scientific Electronic Library Online*, EMBRASE - Databases; Databases – SAÚDE, BIREME - PAHO/WHO - Pan American Health Organization and *Medical Literature Analysis and Retrieval System Online* (MEDLINE).

SYNTHESIS OF THE THEORETICAL FRAMEWORK

Throughout this century, the technological revolution has been characterized by a process whose consequences have had a great impact on modern history.

Technological evolution has been generating new social behaviors, to the extent that individuals establish unprecedented social relationships, whose meanings emerge with the use of technologies. Individuals are often influenced without realizing that the use of technologies

modulates social behaviors, whether the subjects are aware of it or not. From this use, new models of work, health care, learning systems, among others, can emerge (MARTINHO, 2014; HEIFER; SOUZA, 2016; CHRISTIAN; HARBOR; SANTOS, 2016; OLIVEIRA, 2017).

Technology, understood as the set of knowledge applied to a given branch of activity, with emphasis on the scientific aspect, when used in teaching, represents what is specified as educational technology, being a relevant tool for the application, inclusion, strengthening of pedagogical strategies and, mainly, the guarantee of democratic actions (ALMEIDA, 2009).

Technologies alone do not guarantee democratic education, but being connected, knowing how to read, participating in the digital world and the communication network, are preconditions and feeders of freedom – and fed by it (ALMEIDA, 2011). Thus, the inclusion of new technologies in education demands public policies aimed at social inclusion and the insertion of the population in the digital society.

Technological progress has, in a more radical way in the last three decades, profoundly marked the practice in medical courses. In this sense, in order to think about the integration of technologies into the curriculum, it is essential that educators critically interpret this increasingly connected world. A first step is to try to integrate what has been created separately: the curriculum and the technologies.

Integrating technologies into the curriculum implies considering the educational principles and didactics that make up the learning mechanism, incorporating curricular technologies into the methodologies and didactics that facilitate student learning (SÁNCHEZ, 2002).

As important as understanding integration is to talk about the curriculum. The curriculum is a social construction, which is developed in action, interaction between school, knowledge, life and culture, producing diverse paths (ALMEIDA, VALENTE, 2011).

In the literature, there are many concepts attributed to the curriculum (SACRISTÁN, 2000; YOUNG, 2014). For Sacristán (2000), the curriculum is a social construction that systematizes the organization of a formative proposal to be developed over time. The author points out other regulatory issues of the curriculum that delimit the expected educational experience. "The curriculum defines a practical territory in which one can discuss, investigate, but, above all, in which one can intervene." (SACRISTÁN; GÓMEZ, 1998, p. 145).

Michael Young (2014) states that the curriculum is a system of social and power relations with a specific history. This is related to the idea that the curriculum can be understood as knowledge of the powerful. This author also points out that curriculum is also a complex body of specialized knowledge and is related, in other words, to whether the student is able to provide resources for explanations and to think about alternatives, whatever the area of knowledge and the stage of schooling.

RESULTS AND DISCUSSIONS

HISTORICAL CONTEXT OF MEDICAL EDUCATION IN BRAZIL

The first medical school in Brazil was institutionalized in 1808, in Bahia, and was called the "school of surgery" because it trained surgeons and not doctors. The continuity of his education took place in Europe, especially in Portugal (GONÇALVES; BENEVIDES-PEREIRA, 2009).

The first reforms of medical schools took place between 1812 and 1815, when the "schools of surgery" came to be called Medical-Surgical Academies. During this same period, the first moment of revision of the duration of the courses was carried out, with an increase from four to five years. In 1832, the institutions were transformed into Faculties of Medicine, adopting the rules and programs of the Medical School of Paris, with a duration of six years. The students received the title of "Doctor of Medicine, Pharmacist and Midwife" (GONÇALVES; BENEVIDES-PEREIRA, 2009)

The National Curriculum Guidelines (DCN) for the training of physicians were the result of a process that involved political, institutional, cultural and educational aspects. Some of the educational values expressed in these guidelines can be found in the *New School movement* of the early twentieth century. In Brazil, this movement gained strength with the Manifesto of 1932, which opposed the exclusively passive, intellectualized and verbalist tendencies of the traditional school. This movement pointed to the need for change, aimed at an integral formation of the student, in order to develop the capacities of creation and active construction of knowledge. At the end of the 1950s, the 1959 manifesto brought favorable conditions for the elaboration of the Law of Guidelines and Bases of National Education (LDB) of 1961. The Federal Constitution of 1988 contributed with fundamental principles to the revision of the LDB of 1996. This revision valued the formation of citizenship, highlighting the flexibility of the curriculum and the frontiers of science in professional practice (AZEVEDO *et al.*, 2010).

In May 2001, Law No. 10,172 regulated the implementation of the National Education Plan and established the National Curriculum Guidelines (DCNs), in order to ensure "flexibility and diversity in the study programs offered by the different institutions of higher education" (BRASIL, 2001a, p. 33).

The DCNs constituted a general standard of orientation for the elaboration of political-pedagogical projects and curricula by Higher Education Institutions (HEIs) in Brazil. The first resolution with guidelines for the area of Health - Resolution CNE/CES No. 1,133/2001, of August 7, 2001 (BRASIL, 2001b), which provides for the DCN of Medicine, Nursing and Nutrition courses - presents elements on the profile, competencies and skills of the graduates, curricular contents, internships and complementary activities, course organization, monitoring and evaluation that meet the demands of the SUS.

In 2014, another reform of medical education began with the implementation of new DCN for

Undergraduate Courses in Medicine (BRASIL, 2014). According to the current National Curriculum Guidelines (DCNs), medical education must have a critical, reflective, ethical, humanistic and transformative character, to be translated through the articulation of knowledge, skills and attitudes in the areas of competence of health care, management and education. The knowledge to be constructed should be explored through the development of critical-reflective thinking and guided by a dialectical perspective of man's interaction in reality, and not only through transmission and memorization, as occurs in traditional educational models. Curricular training should articulate teaching and practice in the context of the Unified Health System (SUS) and health care should be guided by a comprehensive and humanized approach, including promotion, prevention, treatment, rehabilitation and palliative care, with social commitment and participation. In view of the speed with which new information is produced on health issues, the DCNs point out the importance of incorporating Information and Communication Technologies (ICTs) in educational activities and for access to remote databases.

INSERTION OF NEW TECHNOLOGIES IN MEDICAL EDUCATION

For Brito and Purificação (2011), the reason why technologies are present everywhere reinforces the need and importance of their existence in education. For the authors, education and technology are tools that provide the subject with the construction of knowledge.

In recent years, medicine has witnessed a rapid adoption of innovative technologies that have the potential to significantly enhance medical training. These technologies include: 1. Virtual Reality (VR) and Augmented Reality (AR): allow for the creation of immersive simulation environments, in which students can practice procedures and diagnostics in controlled virtual environments. 2. Artificial Intelligence (AI): used for medical data analysis, disease diagnosis, patient triage, and complex clinical case simulations. 3. Virtual Patients: Computer simulations that represent real patients, allowing students to practice clinical interactions and decision-making in healthcare scenarios. 4. *E-learning* platforms: offer access to teaching materials, recorded classes, and interaction with teachers and classmates online.

New technologies can also bring a number of benefits to medical training. Hands-on training in Virtual Reality and Augmented Reality provides an immersive, hands-on training environment, allowing students to practice procedures and techniques realistically. The personalization of learning is being developed through the *E-learning* and Artificial Intelligence Platforms that allow for the customization of the curriculum to meet the individual needs of the students. Realistic simulations (SR) with so-called virtual patients (PV) and artificial intelligence (AI)-based simulations create realistic clinical scenarios, providing students with valuable experiences.

It should be noted that with the advancement of telemedicine, it has instituted the form of

providing medical services mediated by technologies for care, educational, research, disease prevention and health promotion purposes, Brazilian doctors can perform consultations at a distance. And it can be applied in teleeducation, telecare, telereports and telesurgery.

Technological development puts society in front of another period of change. Surprising innovations provoke reflections on interpersonal interactions, bring comfort, agility in accessing and processing information, and more effective problem solving. The internet makes it easy to access medical resources from around the world, including case studies, research, and expert classes with access to global resources.

FINAL THOUGHTS

Despite the benefits that the integration of new technologies enables, the medical education curriculum is not exempt from current challenges. It is noteworthy that there is still much to explore with regard to the modification of the forms of teaching and learning, in order to make better use of these new technologies, especially within medical education.

The educational environment in the medical field lacks research and studies that develop methods to prove the effectiveness of the use of technological tools within the educational context.

Historically, the medical curriculum is characterized by the fragmentation of actions which, although they allow for changes in education, have been marked by the recognition of a curricular model still in traditional education.

After 9 years of the implementation and development of the last curricular guidelines of the Medicine course, the monitoring and evaluation of the proposed guidelines should allow the adjustments that are necessary for their contextualization and improvement.

As technologies continue to advance, medical training is likely to evolve further. Virtual reality, artificial intelligence, and machine learning can play increasing roles in simulating complex clinical scenarios.

However, it is important to address the ethical and privacy challenges that come with this evolution. As progress advances, it can be expected that medical training will become even more efficient, preparing the physicians of the future to meet the challenges of modern medicine.

REFERENCES

1. Almeida, F. J. (2011). Escola, currículo, tecnologias e desenvolvimento sustentável. *Revista e-curriculum*, 7(1), abril. Disponível em: https://revistas.pucsp.br/index.php/curriculum/article/view/5633/3978. Acesso em: 18 abr. 2022.

2. Almeida, M. J. (2009). Tecnologia e medicina: uma visão da academia. *Revista Bioética*, 8(1), 69-78. Disponível em: https://revistabioetica.cfm.org.br/index.php/revista_bioetica/article/view/262. Acesso em: 18 abr. 2022.

3. Almeida, M. E. B. de, & Valente, J. A. (2011). Tecnologias e Currículo: trajetórias convergentes ou divergentes? São Paulo: Paulus. (Coleção Questões Fundamentais da Educação, 10).

4. Azevedo, F., et al. (2010). Manifesto dos pioneiros da Educação Nova (1932) e dos educadores (1959). Recife: Fundação Joaquim Nabuco: Massangana. Disponível em: https://edisciplinas.usp.br/pluginfile.php/3277739/mod_resource/content/3/Manifesto%20pioneiros.pdf. Acesso em: 18 abr. 2023.

5. Bezerra, I. S., & Sousa, M. R. F. (2016). Arquitetura da informação pervasiva: uma evolução das interfaces computacionais responsivas. *Pesquisa Brasileira em Ciência da Informação e Biblioteconomia*, 11(2), 204-213. Disponível em: https://brapci.inf.br/index.php/res/v/28544. Acesso em: 18 abr. 2023.

6. Brasil. (2001a). Lei nº 10.172, de 9 de janeiro de 2001. Aprova o Plano Nacional de Educação (2001-2010) – PNE e dá outras providências. *Diário Oficial da União*, seção 1, p. 33, Brasília, DF, 10 de janeiro de 2001.

7. Brasil. (2001b). Ministério da Educação. Conselho Nacional de Educação. Câmara da Educação Superior. Parecer CNE/CES nº 1.133, de 7 de agosto de 2001. Estabelece as diretrizes curriculares para os cursos de ciências biológicas. *Diário Oficial da União*, seção 1E, p. 131, Brasília, DF, 3 out 2001. Disponível em: http://portal.mec.gov.br/dmdocuments/ces1133.pdf. Acesso em: 20 nov. 2015.

8. Brasil. (2014). Resolução CNE/CES no 3, de 20 de junho de 2014. Institui Diretrizes Curriculares Nacionais do Curso de Graduação em Medicina e dá outras providências. *Diário Oficial da União*, seção 1, p. 8-11, Brasília, DF, 23 jun.

9. Brito, G. da S., & Purificação, I. da. (2011). Educação e novas tecnologias: um (re)pensar. 3. ed. rev. atual. e ampl. Curitiba: IBPEX.

10. Couto, E., Porto, C., & Santos, E. (Org.). (2016). *App-learning: experiências de pesquisa e formação*. Salvador: Ed. UFBA. Disponível em: https://repositorio.ufba.br/bitstream/ri/30756/1/app_learning_repositorio.pdf. Acesso em: 18 abr. 2023.

11. Gonçalves, M. B., & Benevides-Pereira, A. M. T. (2009). Considerações sobre o ensino médico no Brasil: consequências afetivo-emocionais nos estudantes. *Revista Brasileira de Educação Médica*, 33(3), 482-493. Disponível em:

https://www.scielo.br/j/rbem/a/JrXP6rK5zqSpWqXzZThx7dL/#. Acesso em: 18 abr. 2023.

12. Martinho, D. S. (2014). O ensino online nas instituições de Ensino Superior privado: as perspectivas docente e discente e as implicações na tomada de decisão. Tese (Doutorado em Educação, Tecnologias de Informação e Comunicação na Educação) - Instituto de Educação, Universidade de Lisboa, Lisboa. Disponível em: https://repositorio.ul.pt/bitstream/10451/11686/1/ulsd068758_td_Domingos_Martinho.pdf. Acesso em: 05 set. 2022.

13. Oliveira, C. A. de. (2017). Aprendizagem com mobilidade e ensino de matemática: evidências da utilização na formação inicial do pedagogo. *Laplage em Revista*, 3(3), 261-273. Disponível em: https://www.redalyc.org/journal/5527/552756523021/html/. Acesso em: 26 maio 2023.

14. Sacristán, J. G. (2000). *O Currículo: uma reflexão sobre a prática*. Porto Alegre: Penso.

15. Sacristán, J. G., & Gómez, Á. I. P. (1998). *Compreender e transformar o ensino*. 4. ed. Porto Alegre: Artmed.

16. Sánchez, J. (2002). Integración Curricular de las TICs: Conceptos e Ideas. In: Congresso Iberoamericano Informática Educativa, 6. Disponível em: http://www.niee.ufrgs.br/eventos/RIBIE/2002/actas/paper-325.pdf. Acesso em: 14 jun. 2018.

17. Young, M. (2014). Teoria do currículo: o que é e por que é importante. *Cadernos de Pesquisa*, 44(151), 190-202. Disponível em: https://www.scielo.br/j/cp/a/4fCwLLQy4CkhWHNCmhVhYQd/#. Acesso em: 26 maio 2023.

REALIZATION:

SEVEN
publicações acadêmicas

ACCESS OUR CATALOGUE!

WWW.SEVENEVENTS.COM.BR

CONNECTING THE **RESEARCHER** AND **SCIENCE** IN A SINGLE CLICK.