Research and Practices

in the

Health Sciences

TATIANE PEREIRA SCARPELLI
ELIZA CARMINATTI WENCESLAU
(ORGS.)

RECONECTA
Soluções educacionais

TATIANE PEREIRA SCARPELLI
ELIZA CARMINATTI WENCESLAU
(ORGS.)

Research and Practices in the Health Sciences

ISBN: 978-65-85105-09-5

Editora: Reconecta Soluções Educacionais

São José do Rio Preto – SP

2023

RECONECTA
Soluções educacionais

Dados Internacionais de Catalogação na Publicação (CIP)
(Câmara Brasileira do Livro, SP, Brasil)

Research and practices in the health sciences
[livro eletrônico] / Tatiane Pereira
Scarppelli, Eliza Carminatti Wenceslau (orgs.). –
São José do Rio Preto, SP : Reconecta -
Soluções Educacionais, 2023.
PDF

ISBN 978-65-85105-09-5

1. Ciências da saúde 2. Educação em saúde
3. Saúde - Pesquisa I. Scarppelli, Tatiane Pereira.
II. Wenceslau, Eliza Carminatti

23-168880 CDD-610.3

Índices para catálogo sistemático:

1. Ciências da saúde : Pesquisa 610.3
Tábata Alves da Silva - Bibliotecária - CRB-8/9253

Editora: Reconecta Soluções Educacionais
CNPJ 35.688.419/0001-62
Fone: (17) 99175-6641. Website: reconectasolucoes.com.br
contato@reconectasolucoes.com.br

Editoração: Maxwell Luiz da Ponte
Arte Gráfica: Maxwell Luiz da Ponte
Arte da capa: Maxwell Luiz da Ponte

SUMÁRIO

Chapter 01

TECHNOLOGICAL TRENDS IN HEALTH: RESEARCH AND PRACTICES FOR SCIENTIFIC ADVANCEMENT

Ana Beatriz Vedana

Abstract: This paper explores technological trends in healthcare and their impact on scientific advancement. Through a bibliographic survey using scientific articles and specialized books, the study highlights the transformative effects of innovative technologies on healthcare delivery. Key trends include telemedicine, artificial intelligence, big data analysis, the internet of things, and virtual reality. These technologies enhance clinical data management, improve diagnoses, enable personalized treatments, and increase efficiency in patient care. The research emphasizes the importance of research and development in driving healthcare advancements to address population health challenges. By promoting evidence-based practices and fostering knowledge exchange through congresses and events, continuous improvement in healthcare quality and scientific knowledge can be achieved. The paper proposes a congress focused on technological trends in healthcare, aiming to facilitate discussions among healthcare professionals and researchers on the latest advancements and their impact on scientific progress in favor of health.

Keywords: Technological trends. Healthcare. Scientific advancement. Research practices.

A. B. Vedana Faculdades integradas Aparício carvalho. Porto Velho, RO, Brasil.

In: Scarpelli, Tatiane P.; Wenceslau, Eliza C. (Orgs.). Research and Practices in the Health Sciences. São José do Rio Preto, SP: Reconecta Soluções, 2023.

INTRODUCTION

Technological advancements have had a profound impact on various aspects of society, and the field of healthcare is no exception. In recent years, the integration of technology into healthcare practices has transformed the way medical services are delivered and has significantly contributed to scientific advancement in the field. This research paper aims to explore the current technological trends in healthcare, with a specific focus on their impact on scientific research and practices.

To gather relevant and up-to-date information, a comprehensive bibliographic survey was conducted using scientific articles and specialized books databases. The search employed keywords such as 'technological trends,' 'healthcare,' 'scientific advancement,' 'research,' and 'practices.' Through this process, valuable insights were obtained regarding the transformative role of innovative technologies in the healthcare sector.

The findings of the study highlight several key technological trends that have emerged in healthcare, revolutionizing the way healthcare professionals provide services and patients receive treatment. Notable among these trends are telemedicine, artificial intelligence (AI), big data analysis, the internet of things (IoT), and virtual reality. These technologies have introduced new possibilities for clinical data management, accurate diagnoses, personalized treatments, and increased efficiency in patient care.

Furthermore, the research also underscores the driving forces behind these technological advancements in healthcare. The growing interest in research and development in the field has spurred the creation of more innovative and effective solutions to enhance population health outcomes. Through evidence-based research and practices, continuous improvement in the quality of healthcare services can be achieved, while expanding scientific knowledge in the field.

Recognizing the importance of disseminating updated knowledge and fostering discussions on technological trends in healthcare, this paper proposes the organization of a congress on the theme 'Technological Trends in Healthcare: Research and Practices for Scientific Advancement in Favor of Health.' Such an event would bring together healthcare professionals and researchers to exchange knowledge, present innovative research and practices, and facilitate discussions on the challenges and opportunities in the field.

By delving into the remarkable advancements that technology has brought to the healthcare domain, this research aims to shed light on the transformative power of these technological trends and their implications for scientific advancement. Through interdisciplinary collaboration and the exchange of knowledge, we can work towards harnessing the full potential of these technologies to improve healthcare outcomes and promote scientific progress in the pursuit of better health for all.

TELEMEDICINE: REMOTE MEDICAL SERVICES

The rapid evolution of communication technology has played a pivotal role in transforming healthcare services through telemedicine. Telemedicine refers to the provision of medical services remotely, utilizing communication technologies such as video calls and electronic messaging. This approach has proven to be an efficient solution in overcoming geographical barriers, improving access to medical care, and offering a wide range of healthcare services remotely.

One of the key benefits of telemedicine is the ability to provide medical care to patients in rural areas, where access to healthcare services may be limited. Many of these

areas face physician and specialist shortages, making it challenging to access adequate healthcare. With telemedicine, patients can have virtual consultations with specialist doctors regardless of their geographical location, reducing the need for long and costly travel.

Furthermore, telemedicine also plays a crucial role in emergency situations and intensive care. Through real-time communications, doctors can provide precise and prompt guidance to local healthcare professionals, enabling more efficient decision-making and appropriate treatment. This is especially valuable in remote areas where the presence of specialized physicians may be limited.

Another area where telemedicine has excelled is in the remote monitoring of chronic patients. By utilizing connected medical devices such as blood pressure, glucose, or ECG monitors, patients can regularly and continuously transmit vital data to their doctors. This allows for more effective management of chronic conditions, enabling early interventions and reducing the need for frequent visits to the doctor's office.

However, despite the numerous benefits of telemedicine, there are challenges to be addressed. Issues related to patient data security and privacy, appropriate regulation, and reimbursement for services are important aspects that need to be tackled to ensure the success and widespread adoption of telemedicine.

In summary, telemedicine has proven to be a transformative tool in healthcare delivery. It overcomes geographical barriers, improves access to specialized medical care, and enables continuous monitoring of chronic patients. However, it is essential to address challenges and ethical considerations to maximize the potential of this technology and ensure the quality and safety of healthcare provided through telemedicine.

ARTIFICIAL INTELLIGENCE IN MEDICAL DATA ANALYSIS

Artificial Intelligence (AI) has emerged as a powerful tool in revolutionizing the analysis of medical data. With the exponential growth of healthcare data, AI algorithms are playing a transformative role in extracting valuable insights, improving diagnostic accuracy, and enhancing treatment outcomes.

One of the key applications of AI in healthcare is in medical imaging. AI algorithms can analyze medical images such as X-rays, MRIs, and CT scans, aiding radiologists in detecting abnormalities, making diagnoses, and identifying patterns that may not be easily visible to the human eye. By harnessing the power of deep learning and neural networks, AI systems can continuously learn from vast amounts of labeled data, leading to improved accuracy and efficiency in medical imaging interpretation.

In addition to medical imaging, AI is also being utilized in clinical decision support systems. These systems analyze patient data, including electronic health records, laboratory results, and genetic information, to provide clinicians with evidence-based recommendations for diagnosis and treatment. By integrating AI algorithms into clinical workflows, healthcare professionals can benefit from real-time insights, personalized treatment suggestions, and the potential to identify previously unrecognized patterns or correlations in patient data.

Furthermore, AI is making significant contributions in drug discovery and development. With the ability to process and analyze massive datasets related to molecular structures, chemical compounds, and genetic information, AI algorithms can expedite the identification of potential drug candidates, predict their efficacy, and optimize drug formulations. This not only reduces the time and cost involved in the drug discovery process but also opens doors to the development of personalized medicine tailored to an individual's genetic profile.

However, the integration of AI in healthcare also presents challenges. Ethical considerations, including data privacy and security, as well as concerns about the interpretability and transparency of AI algorithms, need to be addressed. Additionally, there is a need for robust validation and regulatory frameworks to ensure the safe and effective implementation of AI technologies in clinical settings.

In conclusion, AI is transforming medical data analysis and has the potential to revolutionize healthcare. By leveraging AI algorithms, healthcare professionals can access valuable insights, enhance diagnostic accuracy, and improve treatment outcomes. However, it is crucial to address ethical concerns, ensure data privacy, and establish regulatory guidelines to maximize the benefits of AI while mitigating potential risks. The continued research and development in AI applications hold immense promise for the future of healthcare, paving the way for more efficient and personalized patient care.

VIRTUAL REALITY IN HEALTHCARE

Virtual Reality (VR) technology is making significant advancements in the field of healthcare, offering innovative solutions and transformative experiences for both patients and healthcare professionals. By immersing individuals in computer-generated environments, VR has the potential to revolutionize various aspects of healthcare, including diagnosis, treatment, pain management, and medical training.

One of the key applications of VR in healthcare is in the realm of pain management. VR has shown promising results in reducing pain and anxiety during medical procedures, such as wound care, dental procedures, and physical therapy sessions. By providing immersive and engaging virtual environments, VR distracts patients from the sensations of pain and discomfort, resulting in decreased reliance on traditional pain medications and improved patient comfort.

Moreover, VR technology has been utilized in psychological therapy and mental health treatment. Virtual reality environments can recreate scenarios that simulate the sources of anxiety or phobias, allowing therapists to guide patients through exposure therapy in a controlled and safe setting. This approach has demonstrated effectiveness in treating conditions such as post-traumatic stress disorder (PTSD), specific phobias, and anxiety disorders.

In the field of medical training and education, VR offers immersive and realistic simulations that allow healthcare professionals to practice complex procedures in a risk-free environment. Surgeons can perform virtual surgeries, medical students can practice diagnosing rare conditions, and emergency responders can train for high-stress scenarios. VR-based training not only enhances technical skills but also fosters critical thinking, decision-making, and teamwork among healthcare professionals.

Virtual reality also has the potential to improve patient outcomes through enhanced rehabilitation and therapy programs. By incorporating motion tracking and interactive exercises, VR-based rehabilitation programs can provide engaging and personalized interventions for individuals recovering from injuries or strokes. These programs encourage active participation and can be adapted to the specific needs and abilities of each patient, resulting in improved motivation, adherence, and functional outcomes.

Despite its numerous benefits, the implementation of VR in healthcare also presents challenges. Ethical considerations, such as informed consent, privacy, and potential side effects of prolonged VR use, need to be carefully addressed. Additionally, the cost and accessibility of VR technology may pose barriers to widespread adoption in certain healthcare settings.

In conclusion, virtual reality technology holds immense potential to transform healthcare. From pain management and psychological therapy to medical training and rehabilitation, VR offers immersive and effective solutions. By harnessing the power of VR, healthcare professionals can enhance patient care, improve treatment outcomes, and advance medical education. Addressing ethical considerations and ensuring affordability will be crucial in maximizing the benefits of virtual reality in healthcare and creating a more patient-centered and technologically advanced healthcare system.

INTERNET OF THINGS IN HEALTHCARE

The Internet of Things (IoT) has emerged as a disruptive force in healthcare, revolutionizing the way healthcare services are delivered, monitored, and managed. IoT refers to the network of interconnected devices and sensors that collect and exchange data, enabling seamless communication and integration in various healthcare settings.

One of the key applications of IoT in healthcare is in remote patient monitoring. Connected wearable devices, such as smartwatches, fitness trackers, and medical sensors, can continuously collect and transmit vital signs, activity levels, and other health-related data to healthcare providers. This real-time monitoring allows for early detection of abnormalities, timely interventions, and personalized care, particularly for patients with chronic conditions or those who require frequent monitoring.

IoT also enables the creation of smart hospitals and healthcare facilities. Connected devices, such as smart beds, smart medication dispensers, and asset tracking systems, can optimize operational efficiency, improve patient safety, and enhance resource utilization. For example, smart beds equipped with sensors can detect patient movement, alert caregivers to reposition patients to prevent pressure ulcers, and adjust mattress firmness based on individual needs. These interconnected systems streamline workflows, reduce errors, and enhance overall patient experience.

Another area where IoT is making a significant impact is in medication management. Smart pill dispensers and medication adherence systems can remind patients to take their medications, track adherence, and provide alerts to healthcare providers or family members in case of missed doses. This technology helps prevent medication errors, improves medication adherence rates, and ultimately leads to better health outcomes, particularly for patients with complex medication regimens.

Furthermore, IoT plays a crucial role in ensuring the integrity and safety of medical equipment and supplies. Connected devices can monitor and track inventory levels, expiration dates, and maintenance needs, allowing for proactive management and minimizing the risk of equipment failure or shortages. Additionally, IoT-based asset tracking systems enhance the traceability of medical devices, reducing the likelihood of lost or misplaced equipment and ensuring their availability when needed.

While IoT in healthcare offers numerous benefits, it also raises important considerations regarding data security and privacy. The sensitive nature of health data necessitates robust cybersecurity measures to protect patient information from unauthorized access or breaches. Implementing encryption protocols, secure data transmission, and strong access controls are essential in safeguarding patient privacy and maintaining trust in IoT-enabled healthcare systems.

In conclusion, the Internet of Things is transforming healthcare by enabling remote patient monitoring, optimizing hospital operations, improving medication management, and enhancing equipment and supply chain management. The seamless integration of IoT devices and systems has the potential to enhance patient care, improve outcomes, and increase operational efficiencies. However, it is vital to address

cybersecurity concerns and ensure the privacy and security of patient data to fully realize the benefits of IoT in healthcare. By doing so, we can create a connected and intelligent healthcare ecosystem that delivers personalized, efficient, and high-quality care to patients.

RESEARCH AND DEVELOPMENT: TECHNOLOGICAL INNOVATION IN HEALTHCARE

Research and development (R&D) plays a critical role in driving technological innovation in the healthcare sector. The continuous advancement of technology has paved the way for groundbreaking discoveries, transformative therapies, and improved patient care. In this context, R&D serves as the foundation for developing innovative solutions and pushing the boundaries of what is possible in healthcare.

One of the key areas of R&D in healthcare is the development of novel medical devices and technologies. Researchers and engineers work tirelessly to create cutting-edge devices that enhance diagnostics, treatment, and patient monitoring. From minimally invasive surgical tools to advanced imaging systems, these innovations have revolutionized healthcare practices, enabling earlier and more accurate diagnoses, precise interventions, and improved patient outcomes.

Additionally, R&D efforts in pharmaceuticals and biotechnology have led to the discovery and development of groundbreaking drugs and therapies. Scientists explore new compounds, study disease mechanisms, and conduct clinical trials to identify effective treatments for various conditions. The advent of precision medicine, which tailors treatments based on an individual's genetic profile, is a result of extensive research and development efforts. These advancements offer personalized approaches to healthcare, optimizing therapeutic outcomes and reducing adverse effects.

Moreover, R&D is instrumental in advancing digital health technologies and software solutions. Researchers collaborate with data scientists and software engineers to develop innovative applications, algorithms, and platforms that leverage artificial intelligence, big data analytics, and machine learning. These technologies have the potential to revolutionize healthcare delivery, enabling real-time monitoring, predictive analytics, and personalized interventions.

R&D efforts also focus on exploring emerging technologies such as blockchain, nanotechnology, and 3D printing in the healthcare context. These technologies hold immense promise in areas such as secure and interoperable health data exchange, targeted drug delivery systems, and personalized implants or prosthetics. By investing in R&D, healthcare organizations and researchers are at the forefront of exploring the potential of these technologies and driving their application in clinical settings.

Collaboration and partnerships between academia, industry, and healthcare providers are pivotal in advancing R&D efforts. By fostering interdisciplinary collaboration, sharing knowledge and resources, and establishing research networks, stakeholders can leverage their collective expertise to accelerate innovation and translate research findings into real-world applications.

Furthermore, funding and policy support are essential to fuel R&D in healthcare. Governments, research institutions, and private organizations need to allocate resources and provide an enabling environment for researchers to pursue innovative ideas and conduct rigorous studies. Encouraging a culture of innovation, supporting early-stage startups, and promoting collaboration between academia and industry are crucial steps to foster technological advancements in healthcare.

In conclusion, research and development are the driving forces behind technological innovation in healthcare. Through R&D efforts, new medical devices, pharmaceuticals, digital health solutions, and emerging technologies are developed, transforming healthcare practices and improving patient outcomes. Collaboration, funding, and policy support are vital in nurturing an ecosystem that fosters innovation and enables the translation of research findings into meaningful applications. By investing in R&D, we can continue to push the boundaries of healthcare and unlock the potential for future advancements that will benefit patients worldwide.

ETHICAL CONSIDERATIONS IN TECHNOLOGICAL HEALTHCARE ADVANCEMENTS

As technological advancements continue to reshape the healthcare landscape, it is crucial to address the ethical considerations associated with these developments. While technologies such as artificial intelligence, big data analytics, and telemedicine offer numerous benefits, they also raise important ethical concerns that need to be carefully examined and addressed.

One of the primary ethical considerations is the protection of patient privacy and data security. With the vast amount of healthcare data being generated and utilized, there is a need to ensure that patient information is securely stored, transmitted, and accessed. Striking a balance between data sharing for research and treatment purposes while safeguarding patient privacy is a critical challenge. Additionally, there is a need for transparency in informing patients about the use and potential risks of their data, as well as obtaining their informed consent for data collection and utilization.

Another ethical concern is the potential for bias and discrimination in technological healthcare advancements. Algorithms used in decision-making processes, such as clinical diagnoses or treatment recommendations, can inadvertently perpetuate biases if the underlying data used to train these algorithms is not diverse or representative. This raises concerns about equitable access to healthcare services and the potential for disparities in treatment outcomes. It is essential to address these biases through rigorous algorithm development, diverse and inclusive data sets, and continuous monitoring and evaluation of the algorithms' performance.

Furthermore, the impact of technological advancements on the patient-provider relationship and the role of healthcare professionals should also be considered. While technologies such as telemedicine offer convenience and accessibility, they may compromise the personal connection between patients and providers. The ethical implications of remote consultations, the potential for miscommunication or misdiagnosis, and the importance of maintaining a compassionate and empathetic approach to patient care should be carefully examined.

Additionally, questions of responsibility and accountability arise in the context of technological healthcare advancements. Who should be held responsible if an AI algorithm makes an erroneous diagnosis or if a telemedicine consultation fails to identify a critical condition? Determining liability and establishing clear guidelines for accountability in these situations is essential to ensure patient safety and trust in technological healthcare solutions.

To address these ethical considerations, a collaborative approach involving healthcare professionals, policymakers, technology developers, and ethicists is crucial. Ethical frameworks and guidelines should be developed to guide the responsible and ethical implementation of healthcare technologies. Additionally, continuous monitoring,

auditing, and oversight of these technologies are necessary to ensure their adherence to ethical principles and to address any emerging ethical concerns.

In conclusion, while technological advancements in healthcare hold immense promise, ethical considerations must be at the forefront of these developments. Protecting patient privacy, addressing biases, preserving the patient-provider relationship, and establishing accountability are critical in maximizing the benefits of healthcare technologies while minimizing potential harms. By proactively addressing these ethical concerns, we can foster a healthcare system that leverages technology for improved patient outcomes while upholding ethical principles and values.

CASE STUDIES: IMPLEMENTING TECHNOLOGICAL TRENDS IN HEALTHCARE

The implementation of technological trends in healthcare has witnessed remarkable success stories and impactful case studies that exemplify how these innovations are being integrated into diverse contexts and their contributions to scientific advancement. Examining these real-world examples provides valuable insights into the practical application and benefits of technological trends in healthcare.

One noteworthy case study is the implementation of telemedicine in rural and underserved areas. Telemedicine leverages communication technologies to connect patients with healthcare providers remotely, overcoming geographical barriers and improving access to quality healthcare. In regions where access to healthcare facilities is limited, telemedicine has enabled timely medical consultations, specialist referrals, and follow-up care, ultimately leading to improved health outcomes and patient satisfaction.

Another compelling example is the use of artificial intelligence (AI) in medical imaging and diagnostics. AI algorithms can analyze vast amounts of medical imaging data, assisting healthcare professionals in the detection of abnormalities and the diagnosis of diseases. Studies have shown that AI-powered systems can achieve comparable or even superior accuracy in diagnosing conditions such as breast cancer, lung diseases, and cardiovascular disorders. The integration of AI in radiology and pathology departments has led to faster and more precise diagnoses, enabling timely interventions and improving patient outcomes.

Big data analysis has also demonstrated its transformative potential in healthcare. By aggregating and analyzing large volumes of healthcare data, including electronic health records, genomics data, and real-time patient monitoring data, researchers and healthcare professionals can gain valuable insights for disease surveillance, personalized medicine, and population health management. For instance, analyzing patterns in population health data has helped identify disease outbreaks, predict disease progression, and inform public health interventions.

The Internet of Things (IoT) has shown significant promise in enhancing patient safety and care quality. Through the integration of interconnected devices and sensors, IoT-enabled solutions enable real-time monitoring of vital signs, medication adherence, and environmental conditions. This technology has been successfully implemented in hospitals to automate temperature monitoring, track equipment usage and location, and ensure compliance with safety protocols, leading to improved patient safety, streamlined workflows, and efficient resource utilization.

Virtual reality (VR) has emerged as a powerful tool in healthcare, with applications ranging from pain management to medical training. In the realm of pain management, VR technology provides immersive experiences that distract patients from

discomfort during medical procedures, reducing the need for traditional pain medications. Additionally, VR simulations are being used to train healthcare professionals, allowing them to practice complex procedures in a safe and controlled environment, ultimately enhancing their skills and confidence.

These case studies and success stories highlight the tangible benefits and transformative impact of implementing technological trends in healthcare. By leveraging telemedicine, artificial intelligence, big data analysis, the Internet of Things, and virtual reality, healthcare providers have been able to improve access to care, enhance diagnostics and treatment, optimize resource utilization, and empower both patients and healthcare professionals.

Sharing these examples not only showcases the potential of technological trends but also inspires further innovation and encourages the adoption of these advancements in healthcare settings. It serves as a reminder of the importance of continuous research, collaboration, and the integration of technology in healthcare to drive scientific advancement and ultimately improve patient outcomes on a global scale.

FINAL CONSIDERATIONS

As technological trends in healthcare have continued to advance, it is evident that they hold immense potential for scientific advancement and improving the overall quality of healthcare. Throughout this paper, we have explored various technological trends, including telemedicine, artificial intelligence, big data analysis, the Internet of Things, and virtual reality, and their impact on healthcare practices and research.

These technological advancements have transformed the way healthcare services are delivered, enabling remote consultations, enhancing diagnostics and treatment accuracy, improving patient monitoring, and streamlining operational processes in healthcare facilities. Moreover, they have paved the way for personalized medicine, evidence-based decision-making, and more efficient resource utilization.

It is important to highlight that the implementation of technological trends in healthcare is not without challenges. Ethical considerations, such as patient privacy and data security, need to be carefully addressed to ensure the responsible and ethical use of these technologies. Furthermore, the cost of implementation, interoperability of systems, and accessibility issues are aspects that require attention to ensure equitable access to technological advancements in healthcare.

To fully harness the potential of technological trends in healthcare, collaboration among stakeholders is crucial. Healthcare professionals, researchers, industry leaders, policymakers, and patients must work together to drive innovation, share best practices, and address barriers to implementation. This collaborative approach can foster an ecosystem that promotes research and development, facilitates knowledge exchange, and encourages the adoption of technological advancements in healthcare.

In conclusion, technological trends in healthcare have the power to revolutionize the field, leading to significant scientific advancement and improved patient outcomes. The integration of telemedicine, artificial intelligence, big data analysis, the Internet of Things, and virtual reality has already shown promising results in terms of enhanced healthcare delivery, personalized medicine, and optimized operational efficiency. However, it is essential to remain mindful of the ethical considerations and challenges associated with these advancements.

By embracing these technological trends, healthcare systems can transform into more patient-centric, efficient, and evidence-based models. Continuous research,

investment in R&D, and knowledge sharing platforms such as conferences and events focusing on technological trends in healthcare will play a crucial role in driving future advancements and ensuring that the benefits of these technologies are accessible to all individuals, ultimately improving population health and well-being.

ACKNOWLEDGMENT

I would like to express my gratitude to all the people and institutions that contributed to the realization of this work on technological trends in the health area and their impact on scientific advancement. First, I would like to thank the authors of the scientific articles and specialized books used as sources for the bibliographical research. His pioneering studies and research provided a solid foundation for our understanding of the topic and enriched this work with up-to-date and relevant information. I would also like to express my gratitude to the healthcare professionals and researchers who are at the forefront of implementing technology trends in healthcare. Their tireless work and dedication to exploring new solutions and innovations has driven scientific advancement and improved the quality of healthcare. I could not fail to thank the institutions and organizations that support the research and development of technologies in the health area. Your funding and support has been instrumental in driving innovation and ensuring that technology trends are translated into tangible benefits for patients and healthcare professionals. Furthermore, I would like to express my appreciation to the participants of congresses and scientific events related to technological trends in health. Their presentations, discussions and knowledge sharing have been a valuable source of inspiration and learning for my research. Finally, I would like to thank my colleagues, friends and family for their continuous support during the preparation of this work. Your encouragement, encouragement and understanding were key to the completion of this project. I express my sincere gratitude to everyone who, directly or indirectly, contributed to the success of this work. Their collective efforts have helped to expand my knowledge and understanding of technology trends in healthcare and their impact on scientific advancement.

Thank you all!

REFERÊNCIAS

ANGRAAL, S.; KRUMHOLZ, H. M.; SCHULZ, W. L. Blockchain Technology: Applications in Health Care. Circulation: Cardiovascular Quality and Outcomes, v. 11, n. 9, e004553, 2018.

BLUMENTHAL, D.; GLASER, J. P. Information Technology Comes to Medicine. New England Journal of Medicine, v. 356, n. 24, p. 2527-2534, 2007.

INTERNATIONAL DATA CORPORATION. Worldwide Spending on Artificial Intelligence Systems Forecast to Reach $98 Billion in 2023, According to New IDC Spending Guide. IDC Press Release, 2020.

KLONOFF, D. C.; KERR, D. (Eds.). The Internet of Things in Healthcare: Potential Applications and Challenges. Springer, 2019.

KRUMHOLZ, H. M. Big Data and Healthcare: Discipline, Workforce, and Approaches to Enable Transformation. Springer, 2020.

LEE, C. K.; HO, W. H. (Eds.). Artificial Intelligence in Healthcare. Academic Press, 2020.

LOHR, S. The Age of Big Data: A Revolution That Will Transform How We Live, Work, and Think. Basic Books, 2017.

NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE. Artificial Intelligence in Health Care: The Hope, the Hype, the Promise, the Peril. National Academies Press, 2019.

NATIONAL ACADEMIES OF SCIENCES, ENGINEERING, AND MEDICINE. The Future of Nursing 2020-2030: Charting a Path to Achieve Health Equity. National Academies Press, 2020.

ORGANIZAÇÃO MUNDIAL DA SAÚDE. Digital Health: A Call for Government Leadership and Cooperation between ICT and Health. Organização Mundial da Saúde, 2021.

ORGANIZAÇÃO MUNDIAL DA SAÚDE. Telemedicine: Opportunities and Developments in Member States: Report on the Second Global Survey on eHealth 2019. Organização Mundial da Saúde, 2019.

PATEL, V. et al. The Lancet Commission on Global Mental Health and Sustainable Development. The Lancet, v. 392, n. 10157, p. 1553-1598, 2018.

RIZZO, A. S.; KIM, G. J. (Eds.). Virtual Reality in Healthcare. Springer, 2019.

TOPOL, E. J. Deep Medicine: How Artificial Intelligence Can Make Healthcare Human Again. Basic Books, 2019.

WACHTER, R. M. The Digital Doctor: Hope, Hype, and Harm at the Dawn of Medicine's Computer Age. McGraw-Hill Education, 2015.

Chapter 02

ASSISTÊNCIA HUMANIZADA NOS SERVIÇOS DE EMERGÊNCIA: REVISÃO DE LITERATURA

Jefferson Ribeiro Aguiar, Vinícius de Freitas Andrade, Eduardo Henrique Barbosa Adão, Amanda Batista Barrêto.

Abstract: Introduction: Humanized hospital care must consider the patient in his existential context based on the understanding of the physiological, psychological and social dimensions. Objective: Analyze the recommendations and scientific productions in humanized assistance in emergency services. Methodology: This is a descriptive exploratory and integrative literature survey, carried out in March 2023. The search was carried out in specialized databases crossing the terms "humanization AND assistance", "humanized care AND emergency", “humanized AND medicine”. Results: Nine studies were selected who pointed to a close relationship between the quality and the humanization of patient care. This seeks to rescue a distinct service, focused on the dignity of not physical only , but also mental or social and proposing actions that qualify the provision of health. These humanized actions, as a set of human and ethical values, will open new horizons and possibilities to achieve quality and credibility in health services. Final considerations: The multidisciplinary training of health professionals in emergency services through courses and studies that contribute to the construction of knowledge about humanized view to well-being and social security is essential.

Keywords: Assistance. Humanization. Emergency Services.

J. R. Aguiar Universidade Anhembi Morumbi. São Paulo, SP, Brasil.
e-mail: jeffersomsh@hotmail.com.
V. de F. Andrade Universidade Anhembi Morumbi. São Paulo, SP, Brasil.
E. H. B. Adão Universidade Anhembi Morumbi. São Paulo, SP, Brasil.
A. B. Barreto Centro Universitário Santa Maria. Santa Maria, RS, Brasil.

In: Scarpelli, Tatiane P.; Wenceslau, Eliza C. (Orgs.). Research and Practices in the Health Sciences. São José do Rio Preto, SP: Reconecta Soluções, 2023.

INTRODUÇÃO

A humanização na prestação de serviços emergenciais tem sido cada vez mais necessária nas instituições hospitalares. Comumente observamos que a assistência à saúde fragmenta o ser humano voltando-se puramente as suas necessidades biológicas e que os cuidados médicos se tornaram, em grande parte, técnico-mecanicista (RODRÍGUEZ; POLI NETO; BEHRENS, 2020). Essa responsabilidade é dada aos avanços tecnológicos e científicos que exigem do profissional de medicina conhecimento cada vez mais específico, ou seja, exímio em precisar diagnósticos, mas, em muitos casos, ignorante em assistência básica relativo aos aspectos humanos de seu paciente (SILVA et al., 2019).

Nesse contexto a humanização em saúde deve ser entendida como um processo mais do que filosófico, mas um princípio de se prestar assistência. É uma forma de cuidar, compreender, abordar, perceber e respeitar o doente frente a vulnerabilidade. É identificar a melhor intervenção, garantir qualidade de assistência e compreensão singular ao paciente além de ter tempo de vinculação (AZEREDO; SCHRAIBER, 2021).

A assistência humanizada é, portanto, o cuidado na realização das ações e intervenções, que tornam o ser humano exclusivo nos distintos espaços e circunstâncias em que se encontra, o paciente é primordial e o atendimento é personalizado sob um modelo bioético, autônomo, justo e benéfico (ASSIS et al., 2016).

Embora os princípios éticos da assistência humanizada sejam claros e essenciais a qualidade e cuidado, e suas raízes tenham surgido ainda no ano 460 aEC, Carmo e Souza (2018) afirmaram que as exigências por humanização e melhoria nos serviços de saúde no Brasil, só surgiram por volta da década de 70, reconstruindo a história, e exigindo do Sistema único de Saúde (SUS) os pilares da integralidade, universalidade e equidade através da implementação de um Programa Nacional de Humanização da Assistência Hospitalar o PNHAH. Este tinha objetivo de afirmar que o SUS poderia dar certo através de um modelo participativo da sociedade que garantisse acolhimento humanizado aos usuários e organização do serviço, de modo que houvessem investimentos na qualidade de atendimento (GOMES; SMMS, 2021)

Nesse sentido, a assistência hospitalar humanizada deve considerar o paciente em seu contexto existencial, com base na compreensão das dimensões fisiológica, psicológica e social, levando em consideração seus valores de referência e realçando ao máximo o conjunto de suas possibilidades de funcionamento, não somente as fisiológicas, mas, igualmente, as ambientais, sociais, culturais, familiares, individuais, psicológicas e espirituais. Deve evitar-se que o paciente seja descompensado pela angústia e envolvido por suas reações emocionais, incentivando seu acesso à palavra e a expressões que simbolizem seus afetos, partindo do princípio de que esse cuidado com o ser humano doente promove uma saúde integradora em todas as dimensões: física, mental e social (MEZALIRA et al., 2022)

Segundo Sarmento et al. (2019) e Sousa et al. (2021), dentro dos campos de implementação da assistência hospitalar, o que sofre maior dificuldade de implantação é o de urgência e emergência já que as decisões frente ao imediatismo sob estresse e pressão elevam ainda mais a necessidade de equilíbrio emocional e técnicas adequadas aos profissionais de serviços médicos à prestarem serviço humano. As situações estressoras, condições precárias, divergência de opiniões, imediatismo podem inclusive serem fatores que agravam a ineficiência no tratamento e assistência, podendo inclusive agravar ainda mais o adoecimento do paciente (SILVA el al., 2023).

Segundo Sousa, Silva e Nori (2007), a unidade de urgência e emergência é destinada a promover serviços médicos requeridos de acordo com a gravidade do paciente. Assim, precisam ser rápidos, imediatos em suas ações e a equipe de enfermagem

que atua nesse setor devem estar preparados para atender às mais variadas situações. Dessa forma, o enfermeiro deve ter conhecimento científico, prático e técnico, a fim de que possa tomar decisões rápidas e concretas, transmitindo segurança a toda a equipe e, principalmente, diminuindo os riscos que ameaçam a vida do paciente.

Assim implementar a humanização nas práticas de emergência é urgente e possível, desde que as habilidades e competências humanísticas sejam reconhecidas como uma prática essencial aos serviços prestados ao paciente. Portanto, desse pressuposto e da inquietação de compreender e aprofundar o conhecimento quanto a temática abordada, que surgiu o seguinte questionamento: Assistência humanizada é de fato um princípio fundamental a prestação de atendimento nos serviços de emergência?

Busca-se através deste, laçar possíveis reflexões a respeito do tema, por meio de Evidencias e percepções das produções científicas que tratem sobre assistência humanizada nos serviços de emergência. Esta pesquisa por sua vez, servirá como base de estudos futuros a respeito do assunto ora apresentado.

METODOLOGIA

Delineamento da pesquisa

Ao levarmos em conta as problemáticas abordadas nesta pesquisa, bem como estando cientes dos objetivos a serem alcançados, optou-se pela pesquisa descritiva de caráter exploratório e integrativo de literatura. Esta visa compreender um dado fenômeno com a máxima profundidade, fazendo uso da análise dos dados obtidos.

Segundo Andrade (2010) a pesquisa descritiva busca a interpretação de dados e conhecimento intelectual pré-existentes, fazendo uso de metodologias científicas que objetivam expor uma problemática, sem a manipulação dos dados.

O caráter exploratório da pesquisa objetiva ampliar o conhecimento do tema ou problemática, abrangendo desde a criação até a coleta dos dados pertinentes ao projeto, facilitando a construção de uma hipótese especifica sobre um conteúdo pouco explorado e/ou que necessite de aprofundamento através da familiarização e delineamento de um fenômeno a partir da pesquisa com precisão (GASQUE, 2007).

Por sua vez, sucede da revisão integrativa da literatura, sendo esta essencial a todo e qualquer estudo científico, dada a necessidade de síntese das evidências temáticas, assim como a interpretação destas a fim de apontar o real potencial do tema em investigação (CAMPETTI; DORNELES, 2022). Assim, a Revisão Integrativa é uma alternativa de combinar estudos de diversas áreas do conhecimento com metodologias variadas e métodos rigorosos. O método permite a definição de conceitos empíricos e/ ou teóricos sobre um determinado tema. A combinação de pesquisas com diferentes métodos amplia as possibilidades de análise da literatura (CAMPETTI; DORNELES, 2022).

Métodos e procedimentos

O estudo se deu durante o mês de março de 2023, por meio da seleção de artigos científicos publicados em periódicos indexados nas bases de dados Scientific Eletronic Library (SciELO), National Library of Medicine (MEDLINE) e Portal Regional da BVS (LILACS) e Google Acadêmico.

Inicialmente, foi realizada uma busca livre de filtros por produções existentes com as palavras-chave: “humanização AND assistência”, “atendimento humanizado AND emergência”, “medicina AND humanizada” conforme orientação dos Descritores em Ciências da Saúde (DeCS), o operador booleano AND foi usado para cruzamento entre

os termos. Estas permitiram estabelecer hipóteses, explorar o conteúdo e atender aos objetivos da revisão integrativa.

A partir deste levantamento, foi realizada uma leitura dos títulos e resumos, tornando possível filtrar os artigos segundo os critérios de inclusão e exclusão. Os critérios de inclusão utilizados foram: artigos referenciados no período de 6 anos (2017-2023), disponíveis na íntegra, publicados em língua portuguesa, inglesa ou espanhola e de livre acesso nas bases de dados. Os critérios de exclusão foram: documentos duplicados ou que estejam fora do período pré-estabelecido (2017-2023), trabalhos incompletos e que não estejam diretamente relacionados à temática ou fujam daqueles pré-estabelecidos nos objetivos da pesquisa.

Extração

Os artigos foram posteriormente organizados segundo: identificação (título e autores), bem como a descrição das características (objetivo(s), abordagem metodológica e síntese dos principais resultados).

Após esse primeiro momento, os conteúdos foram analisados, fazendo uso do princípio da organização e descrição de dados e indicadores como descritos por Pereira et al. (2018), essa prática possibilita a organização das informações de modo a facilitar a interpretação, descrição e discussão dos resultados abaixo amostrados.

Análise dos dados

Após a coleta e extração o conteúdo e dados foram selecionados e sintetizados por meio da codificação e categorização sugerida por Bardin (2011) e Pereira (2018) a fim de proporcionar a análise dos dados, seguindo as etapas seguintes: 1) pré-análise; 2) exploração do material e 3) tratamento dos resultados, inferência e interpretação.

Foi realizado uma filtragem das principais categorias a fim de obter a caracterização das produções científicas e informações referentes aos objetivos do estudo (ver TABELA 1).

Tabela 1 - Artigos selecionados para análise após critérios de inclusão e exclusão

	Combinação dos descritores segundo as palavras-chave			
	C1	C2	C3	Total
Total de artigos encontrados com busca com critério de inclusão	14	8	19	41
Total de artigos encontrados com critério de exclusão	3	2	4	9

Fonte: Elaborada pelos autores.

Nota: C1- “humanização AND assistência”; C2- “atendimento humanizado AND emergência”; C3- “medicina AND humanizada”.

No total, 41 artigos obedeceram aos critérios de inclusão, segundo os descritores. Ao final de um rigoroso processo de análise, e fazendo uso dos critérios exclusão, permaneceram 9 artigos para análise em sua versão completa

Os descritores, títulos, autores, ano de publicação e o tipo de estudo dos 9 artigos estão dispostos no Quadro 1. Os artigos foram publicados entre os anos de 2019 a 2023, sendo 2 no ano de 2019, 1 no ano de 2020 e 3 no ano de 2021, 1 em 2022 e 2 em 2023 até o momento do levantamento dos dados. Notadamente dentre os artigos que obedecem aos objetivos do estudo prevalecem aqueles documentais, de revisão de literatura (artigos 1, 2, 3, 4, 5, 7, 9), o que demonstra uma tendência metodológica comum ao tema.

Quadro 1 - Estudos selecionados para a revisão integrativa de literatura sobre Assistência humanizada nos serviços de emergência.

Nº	Descritor	Título	Autores	Ano de public.	Tipo de estudo
1		Humanização no ensino de graduação no curso de Medicina: percepção dos alunos	Silva et al.	2019	Exploratório descritivo
2	C1	Humanização nos serviços de urgência e emergência: contribuições para o cuidado de enfermagem	Sousa et al.	2019	Revisão integrativa
3	C3	Atendimento humanizado: as concepções de estudantes de Medicina	Passos et al.	2020	Pesquisa qualitativa exploratória
4	C1	Autoridade, poder e violência: um estudo sobre humanização em saúde	Azeredo e Schraiber	2021	Análise documental
5	C1	A humanização na assistência à saúde: uma revisão histórica da literatura	Sarmento et al.	2021	Revisão integrativa
6	C3	A abordagem da humanização na grade curricular dos cursos de medicina na cidade de maceió	Alves et al.	2021	Pesquisa científica, exploratória, qualitativa
7	C3	A humanização na educação médica no Brasil	Mezzalira et al.	2022	Revisão integrativa
8	C1	Atuação médica humanizada em contextos específicos: a experiência inovadora de uma disciplina de graduação	Wendt et al.	2023	Relato de experiência
9	C1	Entre ouvidos e palavras: um ensaio sobre medicina narrativa, redes sociais e humanização na Atenção Primária à Saúde	Silva et al.	2023	Revisão de literatura

Fonte: Elaborado pelos autores.

A análise dos artigos aponta uma estreita relação entre a qualidade da assistência e da humanização nos serviços de emergência, já que não aparecem divergências de ideias nos estudos. Ou seja, a humanização é apontada como proposta positiva às relações entre equipe médica, pacientes e familiares (artigos 1, 2, 7, 9). Além disso os autores discutem, sobre a importância da relação médico, paciente e familiares através da escuta empática,

na qual a compreensão, escuta, comunicação e acolhimento facilitam o atendimento e possibilita a construção de vínculos.

Nesse sentido Azeredo e Schraiber (2021), sugerem que, embora essencial, a formação profissional ainda é precária, quando poderia ser positiva às condições de trabalho e que a construção de vínculos proporciona assistencialismo de qualidade. Mezalira et al. (2022) reforça sobre a vocação como ferramenta na proporção de cuidados que é direito do paciente.

É possível refletir sobre a importância da assistência humanizada, reforçando a atuação da equipe multiprofissional, ao passo que envolve o processo relacional, o diálogo e a articulação de saberes como facilitadores da execução das ações em saúde. Os artigos 1, 5, 6, 7 e 9 apontam ainda a escuta e observação de consulta como essenciais à formação complementar, já que as vivências reiteram a escuta.

Os autores dos artigos 1, 3, 4, 6, 9 reforçam a prática humanizada como reforço a autonomia, bem como ao bem-estar do paciente e melhora do seu estado de saúde. Recomenda-se, então, evitar que o paciente seja descompensado pela angústia e envolvido por suas reações emocionais, incentivando seu acesso à palavra e a expressões que simbolizem seus afetos, partindo da percepção de que o cuidado com o indivíduo doente deve promover uma saúde integradora em quaisquer dimensões, seja física, mental ousocial.

A educação também é retratada nos estudos 1, 2, 3, 4, 6, 7, 8 e 9 os autores compreendem que a construção profissional, pessoal e humana pode ser feita por meio de metodologias de ensino que capacitem os profissionais de saúde, a formação continuada que igualmente reforçam sobre a postura e a sensibilidade ao sofrimento bem como o ambiente também deve ser considerado, já que este implica diretamente na boa prática clínica, escuta e acolhimento.

Corroboram com estes os autores dos artigos 1, 3, 7 que relacionam a educação médica, a humanização a ética profissional. Objetivam a formação generalista e é possível ser construída com bases no código de Ética médica, na formação complementar e vivências. A educação humanizada na formação médica deve incluir o direito de paciente ser respeitado em sua individualidade, garantem sigilo, partilha no tratamento e direito a discutir o quadro clínico e evolução no estado de saúde do paciente.

CONSIDERAÇÕES FINAIS

A humanização é um movimento crescente e não pode ser adiada já que busca resgatar um atendimento distinto, focado na dignidade das pessoas em situações que envolvam cuidado ou atenção, propondo ações que qualifiquem a prestação de saúde. Essas ações humanizadas, enquanto conjunto de valores humanos e éticos, abrirão novos horizontes e novas possibilidades para alcançar a qualidade e a credibilidade nos serviços de saúde.

É claro, que produções sobre o tema tem avançado consideravelmente nas áreas médicas, mas durante o levantamento bibliográfico a discrepância de estudos voltados a assistência humanizada nas áreas médicas ainda é um pouco escassa visto que, em sua maioria, estavam associadas as áreas da enfermagem.

Considerando as sugestões propostas nos estudos para construção de mecanismos que proporcionem atendimento humanizado, é possível destacarque a capacitação dos profissionais, a qualidade da experiência em saúde oferecida, bem como, em especial, o

trabalho junto às diretrizes governamentais torna-se essenciais na busca de um projeto que seja de grande impacto para o atendimento humanitário nos serviços de emergência.

Dessa forma, deve-se instigar a ampla abordagem do tema em cursos à profissionais de saúde nas áreas médicas e à equipe multidisciplinar de modo a possibilitar uma atuação estratégica dos futuros profissionais, além de incitar mais pesquisas relacionadas ao tema, a fim de contribuir para a construção de novos conhecimentos. Deve-se ainda, buscar constantemente sugestões e alternativas para a prestação de uma assistência à saúde humanizada e qualificada, com vistas no bem-estar e à seguridade social de todos aqueles que necessitam de assistência à saúde em geral.

REFERÊNCIAS

ALVES, I. D. S. S.; DE SOUZA CRESCENCIO, J.; YULITA, J. G.; DE OLIVEIRA FERMOSELI, A. F.; DE OLIVEIRA, J. S. A abordagem da humanização na grade curricular dos cursos de medicina na cidade de Maceió. **Caderno de Graduação-Ciências Biológicas e da Saúde-UNIT-ALAGOAS**, v. 7, n. 1, p. 184-184, 2021.

ANDRADE, Maria Margarida de de. Introdução à metodologia do trabalho científico. *In*: **Introdução à metodologia do trabalho científico**. 2010. p. 158-158.

ASSIS, L. R. D. S.; RIBEIRO, Í. A. P.; ALVES, A. K. E. S.; NETA, M. A. D. Atendimento humanizado no serviço de urgência e emergência: uma revisão sistemática. **Uningá Review**, v. 25, n. 1, 2016.

AZEREDO, Y. N.; SCHRAIBER, L. B. Autoridade, poder e violência: um estudo sobre humanização em saúde. **Interface-Comunicação, Saúde, Educação**, v. 25, p. e190838, 2021.

BARDIN, Laurence. Análise de conteúdo.São Paulo: Edições 70, 2011.

CAMPETTI, Pedro Henrique de Morais; DORNELES, Beatriz Vargas. Uma Revisão Integrativa e Exploratória da Literatura para os Termos Numeralização, Numeramento e Numeracia. **Bolema: Boletim de Educação Matemática**, v. 36, p. 308-331, 2022.

DA ROSA WENDT, J.; NEGRETTO, A. L.; SARMENTO, B. S.; POHL, H. H.; KRUG, S. B. F. Atuação médica humanizada em contextos específicos: a experiência inovadora de uma disciplina de graduação. **Brazilian Journal of Health Review**, v. 6, n. 2, p. 7982-7993, 2023.

DE ANDRADE SILVA, C. L.; CAVALCANTE, G. F.; RAMOS, L. G.; DE SOUZA ANFE, M. L.; DE CASTRO, M. R.; DE CAMPOS MELLO, T. R.; DE MELO BONINI, L. M. Humanização no ensino de graduação no curso de medicina. **Diálogos Interdisciplinares**, v. 8, n. 10, p. 118-132, 2019.

DE PASSOS, V. B. C.; VÉRAS, R. M.; FERNANDEZ, C. C.; LEMOS, O. L.; CARDOSO, G. M. P.; ROCHA, M. N. D. Atendimento humanizado: as concepções de estudantes de medicina. **Revista Brasileira em Promoção da Saúde**, v. 33, 2020.

DE PASSOS, V. B. C.; VÉRAS, R. M.; FERNANDEZ, C. C.; LEMOS, O. L.; CARDOSO, G. M. P.; ROCHA, M. N. D. Atendimento humanizado: as concepções de estudantes de medicina. **Revista Brasileira em Promoção da Saúde**, v. 33, 2020.

DO CARMO, B. A.; DE SOUZA, G. Atuação do enfermeiro na classificação de risco através do protocolo de manchester: uma revisão da literatura. **Revista Eletrônica Acervo Saúde/Electronic Journal Collection Health ISSN**, v. 2178, p. 2091, 2018.

GASQUE, Kelley Cristine G. D. Teoria fundamentada: nova perspectiva à pesquisa exploratória. In: MUELLER, Suzana Pinheiro Machado (Org.). Métodos para a pesquisa em Ciência da Informação. Brasília: Thesaurus, 2007. p. 83-118.

GOMES, E. T.; SMMS, B. Espiritualidade, integralidade, humanização e transformação paradigmática no campo da saúde no Brasil. **Rev Enferm Digit Cuid Promoção Saúde**, v. 5, n. 1, p. 65-69, 2020.

MEZZALIRA, D. P.; FERREIRA, A. C.; ANDRADE, G. H.; TEO, C. R. P. A.; MATTIA, B. J. A humanização na educação médica no Brasil. **Research, Society and Development**, v. 11, n. 1, p. e57711125337-e57711125337, 2022.

PEREIRA, T. D. et al. Nível de ansiedade e depressão em estudantes universitários fisicamente ativos e sedentários. **Revista Científica UNIFAGOC-Multidisciplinar**, v. 6, n. 2, 2022. Disponível em: <https://revista.unifagoc.edu.br/index.php/multi-disciplinar/article/view/808/851> Acesso em: 15 març. 2023.

RODRÍGUEZ, C. A.; POLI NETO, P.; BEHRENS, M. A. Paradigmas educacionais e a formação médica. **Revista Brasileira de Educação Médica**, v. 28, p. 234-241, 2020.

SARMENTO, I. P.; SARMENTO, R. P.; LISBOA, K. O.; BERNARDES, V. R. M.; MANSO, G. G.; CARDOSO, H. C. A humanização na assistência à saúde: uma revisão histórica da literatura. Revista Educação em Saúde v. 9, n. 2, p. 78-87, 2021.

SILVA, A. F. D.; MENDONÇA, M. O. L. D.; SILVA, R. C. F. D.; CORREIA, I. B. Entre ouvidos e palavras: um ensaio sobre medicina narrativa, redes sociais e humanização na Atenção Primária à Saúde. **Interface-Comunicação, Saúde, Educação**, v. 27, p. e220467, 2023.

SILVA, C. L. DE A.; CAVALCANTE, G. F.; RAMOS, L. G.; DE SOUZA ANFE, M. L.; DE CASTRO, M. R.; DE CAMPOS MELLO, T. R.; ...DE MELO BONINI, L. M. Humanização no ensino de graduação no curso de medicina. **Diálogos Interdisciplinares**, v. 8, n. 10, p. 118-132, 2019.

SOUSA, K. H. J. F.; DAMASCENO, C. K. C. S.; ALMEIDA, C. A. P. L.; MAGALHÃES, J. M.; FERREIRA, M. D. A. Humanização nos serviços de urgência e emergência: contribuições para o cuidado de enfermagem. **Revista Gaúcha de Enfermagem**, v. 40, 2019.

Chapter 3

COUNTERFEITING OF PRODUCTS SUBJECTED TO BRAZILIAN HEALTH SURVEILLANCE

Márcia Lombardo

Abstract: The irregularity of products is a growing problem around the world. Adulterated or falsified products put consumers' health at risk and generate negative economic impacts. The objective of this study was to evaluate the profile of occurrences of counterfeiting of products subjected to sanitary surveillance in Brazil between 2020 and 2022. Data were collected from the official website of the Brazilian regulatory agency (ANVISA). The product categories with the highest number of counterfeiting records in the period were medicines, health products and food. The arrest of high-cost medicines and food supplements was evidenced, and several products were supposedly related to the context of the COVID-19 pandemic, a situation that strongly marked the period. Health surveillance actions in cooperation with health professionals, consumers, and distributors are fundamental, especially in situations of greater demand and opportunity for counterfeiting.

Keywords: Fraud. Products Arrest. Health Surveillance.

M. Lombardo Instituto Adolfo Lutz. São Paulo, SP, Brazil.
e-mail: marcia.lombardo@ial.sp.gov.br

In: Scarpelli, Tatiane P.; Wenceslau, Eliza C. (Orgs.). Research and Practices in the Health Sciences. São José do Rio Preto, SP: Reconecta Soluções, 2023.

INTRODUCTION

The health surveillance area covers a vast field of knowledge and practices to prevent health risks arising from production processes and the consumption of goods and services. In Brazil, health surveillance actions are part of the Unified Health System (SUS) (BRASIL, 1990; LOPES; SETA, 2017).

The Brazilian regulatory agency (ANVISA) coordinates a national sanitary surveillance system with the objective of promoting the protection of collective health through the sanitary control of the production and commercialization of products and services, including environments, raw materials, technologies, ports, airports, and frontiers (BRASIL, 1999).

The role of sanitary surveillance is to detect the main problems in the market, define regulation strategies, and minimize risks to the population. The integrated and systematic set of actions aimed at adverse events and technical product complaints consists of postmarketing surveillance (MARTINS; GALATO, 2018; MARTINS; TEIXEIRA, 2019).

Products that are subjected to sanitary surveillance include medicines, food, cosmetics, personal care, sanitizing products, diagnostic products, materials and equipment for medical or dental use, blood products, smoking products, and others (BRASIL, 1999; LOPES; SETA, 2017).

Product irregularities are a growing problem worldwide, especially with the globalization of supply, increased e-commerce, and more complex production chains. Product technical complaints are the result of any alteration, sanitary irregularity or illegal practice, such as lack of registration or operating authorization before the regulatory authority, quality deviations and counterfeiting, which represent potential risks to the consumer's health (MARTINS; GALATO, 2018; MARTINS; TEIXEIRA, 2019).

Adulteration and counterfeiting of products for human consumption are very serious violations and the offender is subjected to the penalties provided by law. These incidents threaten public health and can cause consumer problems, loss of confidence, and negative economic impacts (BRASIL, 1976; OLIVEIRA; MORAES; COELHO, 2021).

The World Health Organization (WHO) strongly recommends that government authorities strengthen supply chains to ensure integrity and traceability. In the case of drug irregularities, for example, this can prolong illness, increase absenteeism, promote resistance to antimicrobials, and in the worst situation, cause deaths due to untreated diseases or intoxication (MARTINS; GALATO, 2018; MELO et al., 2020).

A discussion of the main products subjected to Brazilian health surveillance that showed counterfeiting records during the years 2020, 2021, 2022 will be presented below.

For this purpose, a survey of inspection dossiers was conducted to analyze occurrences of counterfeiting involving medicines, health products, diagnostic products, cosmetics, sanitizing products, and food using the tool for consulting irregular products available in the Inspection and Monitoring section of the ANVISA website.

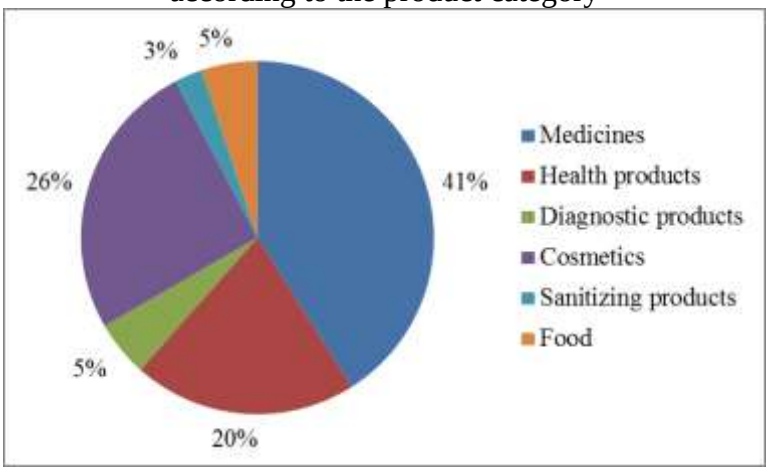
The survey resulted in 95 items, all analyzed individually. This study did not include data related to the status of precautionary measures, number of lots/units arrested, and products that were not clearly specified in the inspection dossiers.

RESULTS AND DISCUSSION

The category of products subjected to sanitary surveillance that showed the highest number of counterfeiting records between 2020 and 2022 was medicines. In this period, it was also possible to highlight health products and food, with high growth in food counterfeiting records during the evaluated period (FIGURES 1 to 3).

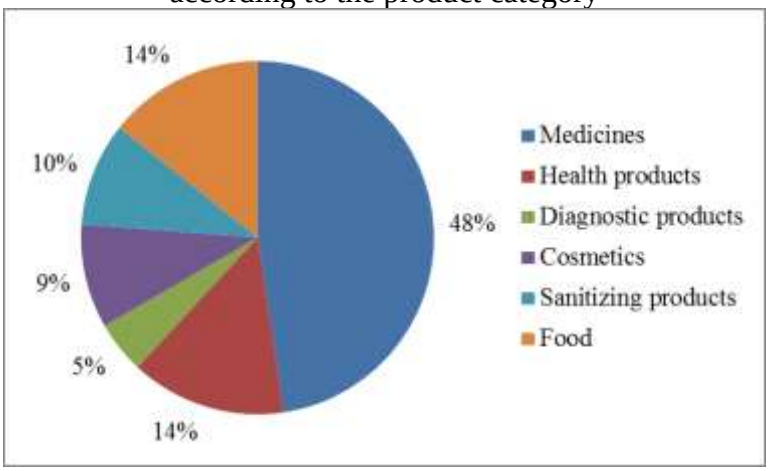
It was observed that 2020 also showed many cosmetic counterfeiting records (FIGURE 1), mainly alcohol gel. This scenario reflects the great demand for this product following the recommendations of health agencies on hand hygiene as a way to contain the spread of the coronavirus SARS-CoV-2.

Figure 1 – Percentage of falsified product inspection dossiers in Brazil in 2020, according to the product category



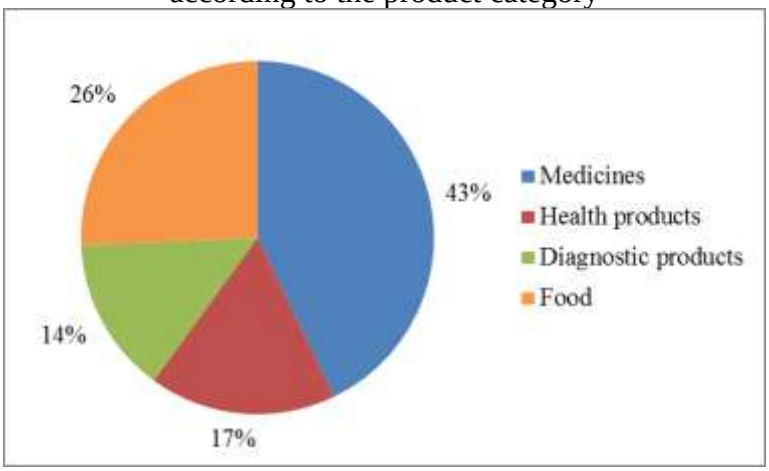
Source: Prepared by the author, based on data from Brazilian health surveillance agency

Figure 2 – Percentage of falsified product inspection dossiers in Brazil in 2021, according to the product category



Source: Prepared by the author, based on data from Brazilian health surveillance agency

Figure 3 – Percentage of falsified product inspection dossiers in Brazil in 2022, according to the product category



Source: Prepared by the author, based on data from Brazilian health surveillance agency

According to Table 1, falsified medicines were marked by several high-cost products, especially somatropin (growth hormone), eculizumab (monoclonal antibody for the treatment of hematological diseases) and immunoglobulin G (antibody against infectious deseases). Defibrotide (antithrombotic), liraglutide (antidiabetic), and testosterone (steroid hormone) also stood out.

Table 1 – Falsified products cited in inspection dossiers in Brazil between 2020 and 2022

Product category	**Year**		
	2020	**2021**	**2022**
Medicines	clonazepam defibrotide* eculizumab* enoxaparin ledipasvir/sofosbuvir liraglutide* moxifloxacin influenza vaccine somatropin*	amphotericin B ascorbic acid atezolizumab azacitidine botulinum toxin eculizumab immunoglobulin G lisdexamfetamine somatropin*	adalimumab drostanolone immunoglobulin G* iopromide medical gases* ruxolitinib somatropin* testosterone* trenbolone
Health products	catheter endodontic files face mask*	dental micromotor* hyaluronic acid (dermal filler)	biguanide (antiseptic)* endodontic files* ozone steamer face mask disposable gloves
Diagnostic products	COVID-19 test HIV test	glucose meter	enzymatic assay kits (glucose, cholesterol) COVID-19 tests* vitamin D rapid test
Cosmetics	alcohol gel* hand sanitizer gel hair products*	skin care product	no report

Product category	Year 2020	2021	2022
Sanitizing products	sodium hypochlorite (disinfectant)	fabric softener liquid laundry detergent	no report
Food	food supplement*	honey olive oil tilapia filet	butter* infant formula food supplement* fish

*products that presented more than one counterfeiting record in the same year.
Source: Prepared by the author, based on data from Brazilian health surveillance agency

Table 2 shows that 22 different drugs were involved in drug counterfeiting records in the period, ten of which were biological products. As for the route of administration, 17 drugs were for parenteral use.

Biological products include vaccines, hyperimmune sera, blood products, monoclonal antibodies, and biopharmaceuticals. Biopharmaceuticals are medicines obtained from biological fluids, animal tissues, or through biotechnological procedures (MINISTÉRIO DA SAÚDE, 2010).

Table 2 – Information on medicines with evidence of counterfeiting cited in inspection dossiers in Brazil between 2020 and 2022

Drug	Dosage Form	Therapeutic indication	Regulatory category
adalimumab	solution for injection	arthritis, ankylosing spondylitis, Crohn's disease, and plaque psoriasis	biological product
amphotericin B	powder for dispersion for infusion	progressive and potentially life-threatening fungal infections	drug
ascorbic acid	solution for injection	scurvy	drug
atezolizumab	solution for injection	locally advanced or metastatic urothelial carcinoma and metastatic non-small-cell lung cancer	biological product
azacitidine	powder for solution for injection	myelodysplastic syndromes, chronic myelomonocytic leukaemia, and acute myeloid leukaemia	drug
botulinum toxin	powder for solution for injection	persistent muscle spasms, chronic migraine, urinary incontinence, excessive sweating of the armpits, and improvement of the facial lines	biological product
clonazepam	oral solution	seizure and panic disorders	drug
defibrotide	concentrated solution for infusion	severe hepatic veno-occlusive disease	biological product
drostanolone	not available	used as an anabolic steroid (injection)	not applicable

Drug	Dosage Form	Therapeutic indication	Regulatory category
eculizumab	concentrated solution for infusion	paroxysmal nocturnal haemoglobinuria, atypical hemolytic uremic syndrome, refractory generalized myasthenia gravis, and neuromyelitis optica spectrum disorders	biological product
enoxaparin	solution for injection	venous thromboembolism, deep vein thrombosis, pulmonary embolism, unstable angina, and myocardial infarction	biological product
immunoglobulin G	solution for infusion	replacement therapy or immunomodulation in cases of immunodeficiency or inflammatory diseases	biological product
influenza vaccine	emulsion for injection	immunization against influenza	biological product
iopromide	solution for injection	contrast agent for intra-arterial or intravenous procedures	drug
ledipasvir/sofosbuvir	tablet	chronic hepatitis C genotype 1 infection	drug
liraglutide	solution for injection	type 2 diabetes mellitus	biological product
lisdexamfetamine	capsule	attention deficit hyperactivity disorder and binge eating disorders	drug
medical gases	gas	diagnosis, treatment or prevention of disease, restoration, correction or modification of physiological functions	medical gas
moxifloxacin	solution for injection	community-acquired pneumonia, skin infections, complicated intra-abdominal infections, plague, acute bacterial sinusitis, and acute bacterial exacerbation of chronic bronchitis	drug
ruxolitinib	tablet	myelofibrosis, polycythemia vera, and graft-versus-host disease	drug
somatropin	powder for solution for injection, solution for injection	growth failures, idiopathic short stature, and growth hormone deficiency	biological product
testosterone	solution for injection	replacement therapy for conditions associated with deficiency or absence of endogenous testosterone	drug

Source: Prepared by the author, based on official websites of the Food and Drug Administration (FDA), European Medicines Agency (EMA), and Brazilian Health Surveillance Agency (ANVISA).

High-cost medicines such as antineoplastics, antirheumatics, and immunomodulators are intended for treating serious and rare diseases that afflict a large part of the population. However, many of these products are not included in the public budget, which often leads to health judicialization (ANUNCIAÇÃO et al., 2019). In this context, it is presumed that this situation encourages the counterfeiting market.

With regard to health products, items applied to the field of dentistry such as endodontic files and dental micromotors were the main products mentioned in the records. In addition, several counterfeiting occurrences of face masks and biguanide antiseptic solutions were observed. It is important to emphasize that this study showed the counterfeiting of several products directly related to the COVID-19 pandemic, a situation that strongly marked the period. Besides antiseptics and protective masks, disposable gloves and COVID-19 tests were described as well as alcohol gel, immunoglobulin G, and medicinal gases as mentioned above (TABLE 1).

The COVID-19 pandemic has increased demand for medicines, vaccines, *in vitro* diagnostics, and laboratory reagents, creating many opportunities for counterfeiting, especially of products sold over the internet. According to the alert issued by the WHO, there was a growing number of falsified medical products that claimed to prevent, detect, treat or cure the disease, requiring greater vigilance from health authorities, health professionals, consumers and distributors around the world to prevent the circulation of these products (WORLD HEALTH ORGANIZATION, 2020).

During the COVID-19 pandemic, the production of immunoglobulin G was impaired by a reduction in blood donations (AGÊNCIA NACIONAL DE VIGILÂNCIA SANITÁRIA, 2022), which probably motivated the counterfeiting of this product. Furthermore, it is likely that the counterfeiting of many products such as monoclonal antibodies, antivirals, antirheumatics, anticoagulants, vaccines, vitamins and others (TABLE 1) is related to the context of the pandemic, whether due to high demand, low supply, hospital needs or the search for solutions to tackling the disease.

With respect to food, it was observed that cases of counterfeiting included products with high market prices, such as butter, olive oil, tilapia filet, and infant formula (TABLE 1). However, food supplements containing vitamins, minerals, proteins, and/or plant ingredients were the ones with the most counterfeiting records, mainly in 2022.

The growing consumption of processed foods and the high added value of certain food products also generate many opportunities for frauds such as counterfeiting, alteration, or adulteration aiming at profitability. Alterations and adulteration in food are practices often adopted to reduce production costs, increase yield, and/or extend shelf life, posing risks to consumer health (OLIVEIRA; MORAES; COELHO, 2021).

In addition, the strong influence of the media and the easy acquisition of food supplements in virtual stores lead to a significant increase in consumption, with the attribution of miraculous effects being common. The high number of products offered on the market makes inspection difficult, which favors the sale of illegal products as well as adulteration with banned substances to intensify the expected effect (DAL MOLIN et al., 2019).

By definition, food supplements are products presented in pharmaceutical forms for oral ingestion intended to supplement the diet of healthy individuals with nutrients, bioactive substances, enzymes, or probiotics, alone or in combination (MINISTÉRIO DA SAÚDE, 2018).

In the studied period, the counterfeiting of food supplements covered several products and different indications such as depurative, cholagogue, antioxidant, antiaging, calming, for the reestablishment of nervous functions, relief of tinnitus, and supplementation for athletes. Examples of substances described in the inspection dossiers

included vitamin C, vitamin D3, nicotinamide mononucleotide (NMN), tauroursodeoxycholic acid (TUDCA) and proteins, among others.

The inspection dossiers of products subjected to sanitary surveillance between 2020 and 2022 mentioned several signs of counterfeiting, but in most cases the registration holder did not recognize the product as original, mainly due to differences in the batch or serial number, followed by other aspects of traceability and visual identity. In some cases, the registration holder declared that the product was not marketed in Brazil or its existence was unknown.

Other evidence described in the records included signs of product adulteration and non-compliance with technical standards. The presence of irregularities before ANVISA was frequent, such as non-compliance with good manufacturing practices, lack of authorization to operate, registration or notification, unauthorized products in Brazil, unauthorized words on the label, manufacturing by unknown company, irregular trade on the internet, importation for natural persons, and even unknown products containing registration data from another company.

FINAL CONSIDERATIONS

Inspection of products subjected to sanitary surveillance is essential to control risks and ensure the safety of the population, especially in emergency public health conditions. This study showed that many products with signs of counterfeiting were arrested during the period marked by the COVID-19 pandemic, mainly high-cost medicines and food supplements. In addition, the data showed the opportunism of the counterfeiting market in view of the irregularities detected in several products directly related to the context of the pandemic, including antiseptics, face masks, disposable gloves, COVID-19 tests, immunoglobulin G, and medical gases.

REFERENCES

AGÊNCIA NACIONAL DE VIGILÂNCIA SANITÁRIA. ANVISA mantém regras para importação de imunoglobulina humana. [Internet]. Brasília: Agência Nacional de Vigilância Sanitária; 2022 [cited May 26, 2023]. Available at: <https://www.gov.br/anvisa/pt-br/assuntos/noticias-anvisa/2022/anvisa-mantem-regras-para-importacao-de-imunoglobulina-humana>

ANUNCIAÇÃO, E.O.; NASCIMENTO, H.G.; SANTOS, H.F.; SANTANA, A.C.A. Medicamentos de alto custo no Brasil: uma análise sobre a judicialização da saúde pública. **Cadernos de Graduação**, v.5, n.3, p.241-52, 2019.

BRASIL. Lei nº 6.360 de 23 de setembro de 1976. Dispõe sobre a Vigilância Sanitária a que ficam sujeitos os medicamentos, as drogas, os insumos farmacêuticos e correlatos, cosméticos, saneantes e outros produtos, e dá outras providências. Diário Oficial da União, Brasília (September 24, 1976); Sec.1:12647.

BRASIL. Lei nº 8.080 de 19 de setembro de 1990. Dispõe sobre as condições para a promoção, proteção e recuperação da saúde, a organização e o funcionamento dos serviços correspondentes e dá outras providências. Diário Oficial União, Brasília (September 20, 1990); Sec.1:18055.

BRASIL. Lei nº 9.782 de 26 de janeiro de 1999. Define o Sistema Nacional de Vigilância Sanitária, cria a Agência Nacional de Vigilância Sanitária, e dá outras providências. Diário Oficial União, Brasília (January 27, 1999); Sec.1:1.

DAL MOLIN, T.R.; LEAL, G.C.; MÜLLER, L.S.; MURATT, D.T.; MARCON, G.Z.; CARVALHO, L.M.; VIANA, C. Regulatory framework for dietary supplements and the public health challenge. **Revista de Saúde Pública**, v.53, n.90, p.1-12, 2019. DOI: <https://doi.org/10.11606/s1518-8787.2019053001263>

LOPES, R.G.A.; SETA, M.H. Integration laboratories-sanitary surveillance: a review. **Vigilância Sanitária em Debate**, v.5, n.2, p.97-105, 2017. DOI: <https://doi.org/10.22239/2317-269X.00908>

MARTINS, M.A.F.; GALATO, D. Irregularities's drugs marketed in Brazil: an analysis of notifications and sanitary measures from 2012 to 2017. **Vigilância Sanitária em Debate**, v.6, n.4, p.23-33, 2018. DOI: <https://doi.org/10.22239/2317-269X.01165>

MARTINS, M.A.F.; TEIXEIRA, A.P.C.P. Challenges and perspectives in surveillance of post-marketing/use. **Vigilância Sanitária em Debate**, v.7, n.4, p.3-9, 2019. DOI: <https://doi.org/10.22239/2317-269X.01425>

MELO, V.A.Z.C.; BETETO, A.L.; GREGIS, C.; REBELO, F.; CURADO, V.; RODRIGUES, A.; PASSOS, C.M.C.; ROCHA, M.; ARAÚJO, A.; DIAS, E. Rastreabilidade na cadeia de medicamentos brasileira: uma Nota Técnica com ênfase na fase experimental do Sistema Nacional de Controle de Medicamentos (SNCMe). **Boletim do Instituto de Saúde**, v.21, n.1, p.211-23, 2020. DOI: <https://doi.org/10.52753/bis.2020.v21.36744>

MINISTÉRIO DA SAÚDE. Agência Nacional de Vigilância Sanitária. RDC nº 55 de 16 de dezembro de 2010. Dispõe sobre o registro de produtos biológicos novos e produtos biológicos e dá outras providências. Diário Oficial da União, Brasília (December 17, 2010); Sec.1:110.

MINISTÉRIO DA SAÚDE. Agência Nacional de Vigilância Sanitária. RDC nº 243 de 26 de julho de 2018. Dispõe sobre os requisitos sanitários dos suplementos alimentares. Diário Oficial da União, Brasília (July 27, 2018); Sec.1:100.

OLIVEIRA, S.R.B., MORAES, L.D.S., COELHO, C.P. Fraudes em alimentos industrializados. **Pubsaúde**, n.5, p.1-5, 2021. DOI: <https://dx.doi.org/10.31533/pubsaude5.a115>

WORLD HEALTH ORGANIZATION. Medical Product Alert N°3/2020: Falsified medical products that claim to prevent, detect, treat or cure COVID-19. 2020. Available at: <https://www.who.int/news-room/detail/31-03-2020-medical-product-alert-n-3-2020>. Access on May 22, 2023.

Chapter 4

ANALYSIS OF THE TERMS OF CURRICULAR COMPONENTS IN POSTGRADUATE COURSES IN THE HEALTH AREA OF A PUBLIC UNIVERSITY

Manuella Oliveira Nascimento

Abstract: Postgraduate courses aim to train teaching professionals and researchers, but some courses do not focus on teaching preparation and solely concentrate on research training. This study analyzed the curricular components of 10 postgraduate courses in the health area at a public university in the Federal District, Brazil. The terms of the curricular components were transcribed and analyzed using the IRAMUTEQ software, and the results were subsequently interpreted. It was found that the curricula predominantly contained terms related to research and few terms related to teaching. Thus, both the literature and this study highlight a low emphasis on curricular components focused on teaching in areas such as health, indicating the need for greater investment in this subject matter by both teachers and educational institutions.

Keywords: Teacher Training. Curricular Components. Postgraduate Education. Health Area. Content Analysis.

M.O. Nascimento University of Brasília, Brasília, DF, Brazil.
e-mail: profa.manuellanascimento@gmail.com

In: Scarpelli, Tatiane P.; Wenceslau, Eliza C. (Orgs.). Research and Practices in the Health Sciences. São José do Rio Preto, SP: Reconecta Soluções, 2023.

INTRODUCTION

Stricto sensu postgraduate courses aim to provide training that encompasses both theory and practice, preparing professionals to work as teachers and researchers in their respective fields (NUNES; FERRETO; BARROS, 2010; CÔRREA; RIBEIRO, 2013b). Among the roles of a higher education professor are teaching, research, and extension activities, either jointly or separately (DIAS, 2009; PIMENTA; ANASTASIOU, 2014; RIBEIRO; SCHERRE, 2022).

Teaching-focused education is crucial in postgraduate courses, as professionals graduating from these programs may play important roles as educators and mentors (VERÇOSA; LIMA, 2019). However, the scientific literature has indicated a low emphasis on curricular components focused on teaching in these courses, leading to various problems related to education (CÔRREA; RIBEIRO, 2013b; VERÇOSA; LIMA, 2019; SILVA; PINTO, 2019).

When teachers do not receive proper training for teaching, they have to rely solely on the specific knowledge of their field and their own practical experience (PIMENTA; ANASTASIOU, 2014; ARAÚJO, 2022), which can result in ineffective pedagogical practices and insufficient education for students (VERÇOSA; LIMA, 2019). Therefore, a focus on teaching in teacher training is essential for teachers to develop skills and competencies in planning, implementing, and evaluating teaching activities (MANHÃES, 2020).

The lack of emphasis on teaching preparation is common in many fields, including the health field, where the primary objective is often to train research-oriented specialists, resulting in reduced emphasis on the development of pedagogical skills and the preparation of professionals for teaching roles (MANHÃES, 2020; FIGUEREDO et al., 2017; OLIVEIRA; RIBEIRO, 2020). This lack of preparation for teaching is even cited by teachers in the field as one of the greatest difficulties in their professional teaching practice (PIVETTA et al., 2019).

The curricular components of postgraduate courses play a central role, as they are responsible for structuring and guiding the curriculum, ensuring comprehensive and up-to-date training (FIGUEIREDO et al., 2017). Furthermore, these components, which may include theoretical courses, practical activities, internships, seminars, and research, among others, should enable the acquisition of specific knowledge, the improvement of technical skills, and the development of a critical and reflective understanding of the field of study (NUNES; FERRETO; BARROS, 2010; CÔRREA; RIBEIRO, 2013b).

Considering the aforementioned points and that specific knowledge alone is not sufficient for the performance of university professors, requiring proper teaching preparation (MASETTO, 2012), the objective of this study was to analyze whether the curricula of postgraduate courses in the health field provide teaching-focused education. To achieve this, the curricular components of health courses at a public university located in the Federal District, Brazil, were examined.

METHOD

The research is an exploratory study with a qualitative-quantitative approach. To collect data, the curricula of master's and doctoral programs available on the website of a public health sciences university in the Federal District, Brazil, were downloaded. Ten curricula from the following courses offered by the university at the master's and doctoral levels were analyzed: Nursing, Pharmacy, Nutrition, Dentistry, and Public Health.

After collecting the curricula and using Excel, the data were transcribed into a table. The columns of the table included the course level (master's or doctoral), the course name, and the names of the curricular components. After transcribing the data into the table, the resulting texts were reviewed, removing special characters, replacing abbreviated terms, and correcting misspelled terms.

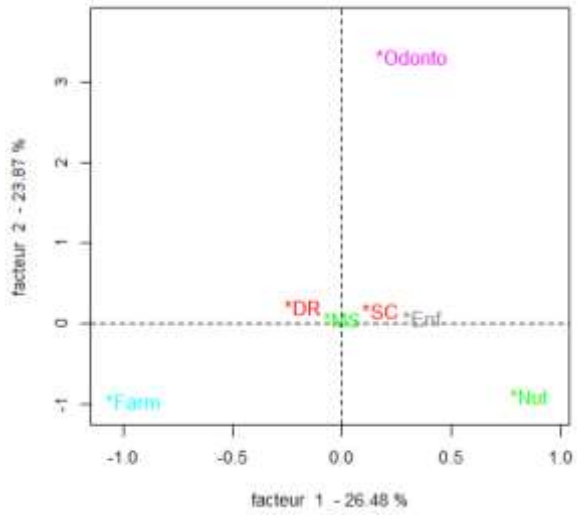
The texts were then encoded and transferred to Notepad, following the recommendations in the software manual (SALVIATI, 2017), and the resulting text (textual corpus) was analyzed using the IRAMUTEQ version 0.7 Alpha 2 and R Version 3.2.3 software.

RESULTS AND DISCUSSION

The analyzed curricula contained a total of 536 curricular components, with 280 from the master's programs and 256 from the doctoral programs. Furthermore, there were 71 components from the Nursing program, 153 from the Pharmacy program, 103 from the Nutrition program, 58 from the Dentistry program, and 151 from the Public Health program.

The curricula resulted in a textual corpus with 71 text segments, 2314 occurrences, 412 forms, and 113 hapax. According to the factorial analysis (Figure 1), it was observed that there was no difference between the terms present in the master's and doctoral curricula. However, the curricula differed more based on the specific course they belonged to, with the Public Health and Nursing programs being closer to each other and the Pharmacy, Dentistry, and Nutrition programs being farther apart from each other and from the others.

Figure 1 - Factorial analysis of the terms of the analyzed variables, including: doctoral (DR), master's (MS), nursing (Enf), pharmacy (Farm), nutrition (Nut), dentistry (Odonto), and public health (SC).

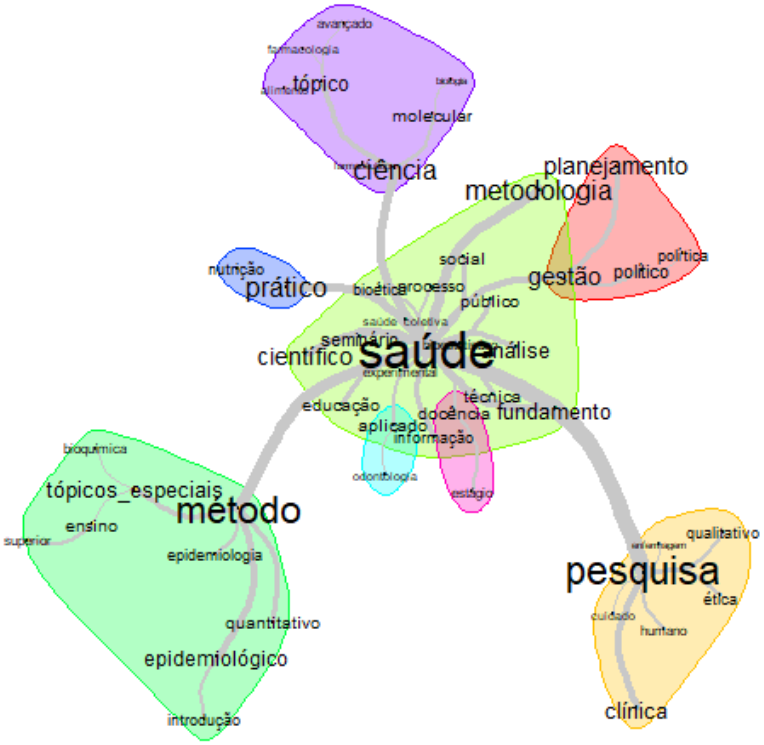


Source: Prepared by the author.

The proximity of the master's and doctoral components in the factorial analysis is due to the fact that the curricula offered almost the same curricular components in both modalities. However, at the doctoral level, the programs required a greater number of components to be fulfilled. What differentiated the components was the course they originated from, as each course focused on a different subject. For example, nutrition had components more focused on food and nutrition, while dentistry focused on oral health. Public health and nursing were closer, likely because they had many components related to public health in general, while the other courses had more specific components.

Regarding the analysis of term similarity among the 50 most recurring terms in the curricula, eight word clusters were identified, with the most relevant terms being "health," "method," and "research" (Figure 2). Terms such as “ensino” (‘teaching’, translated from Portuguese) “docência” ("teaching practice", translated from Portuguese), or “didática” ("didactics", translated from Portuguese) were not among the most frequent or prominent terms, indicating that they are not highlighted in the figure.

Figure 2 – Result of the similarity analysis of the relationship between the most frequent terms in the curricula (in Portuguese).



Source: Author.

The term “educação” (‘education’, translated from Portuguese) appears in the analysis of term similarity; however, only “docência” is actually related to it. This is because many curricula included curricular components such as “educação em saúde” ("health education", translated from Portuguese), which does not refer to teaching in the university context, but rather to health education in clinical practice between healthcare professionals and patients. Considering this, only “docência” among the 50 analyzed terms is actually related to the act of teaching, with the term “estágio” (‘internship’, translated from Portuguese) referring to curricular components such as “estágio em docência” ("teaching internship", translated from Portuguese).

Analyzing the most frequent terms (Table 1) overall and at the master's and doctoral levels, the term "health" was the most frequent, likely because the courses belonged to the health field. It is also possible to observe the presence of terms related to research, such as "research," "method," "methodology," and "scientific," which appeared in components like "scientific research methodology" or "scientific method." Once again, terms related to teaching do not appear among the most relevant, and the other terms refer to the objects of study in the courses.

Table 1 - Result of the main terms that appeared in the curricula and the respective frequency in the curricula in general, at the master's and doctoral level.

GENERAL		**MASTER'S**		**DOCTORAL**	
Term	**Freq.**	**Term**	**Freq.**	**Term**	**Freq.**
health	102	health	51	health	51
method	57	method	34	research	25
research	53	research	28	method	23
nutrition	31	nutrition	17	methodology	17
analysis	31	analysis	16	scientific	15
methodology	30	special_topics	15	science	15
special_topics	28	planning	15	analysis	15
science	28	epidemiological	15	dentistry	14
scientific	28	methodology	13	nutrition	14
dentistry	26	scientific	13	special_topics	13
practical	25	science	13	management	13
planning	25	practical	13	politician	12
management	25	clinic	13	practical	12
epidemiological	25	dentistry	13	seminar	12
seminar	22	management	12	basis	11

Source: Author.

Considering that neither in the term similarity analysis nor in the overall frequency analysis were there any occurrences of terms related to teaching, it is possible to observe a lack of focus in this area. This result is consistent with the studies by Pivetta et al. (2019), Oliveira and Ribeiro (2020), and Manhães (2020), which also found a low emphasis on the preparation for teaching in the field of health, leading to difficulties in the professional performance of educators in this area.

It is important to consider that research has justifications for receiving greater investment and emphasis within the university. This is because research serves as a source

of resources and investments, as successful research projects can attract external funding, industry partnerships, and sponsorships. This is due to the fact that research provides new discoveries, theories, and innovations, resulting in tangible and significant contributions to society. On the other hand, teaching does not yield immediate or tangible results and may take years to bear fruit (KETELE, 2003; MAGALHÃES, 2013).

The overemphasis on research in the academic environment can also affect the education of graduate students in other fields, due to the pressure for scientific production, excessive workload, and academic prestige and international recognition associated with research. In fact, this dynamic may explain the neglect of pedagogical training for students, leading to a lack of interest even among the students themselves, given the context (VERÇOSA; LIMA, 2019; OLIVEIRA; RIBEIRO, 2020).

In Table 2, it is possible to observe that the terms "teaching practice" and "teaching" appear in 3 out of 5 curricula (nursing, nutrition, and dentistry). In the nursing curriculum, "research" appeared nearly 5 times more frequently than "teaching"; in the dentistry curriculum, "scientific" appeared 3 times more frequently than "teaching_practice"; and only in the nutrition curriculum did "teaching " appear more frequently than "research."

Table 2 - Result of the main terms that appeared in the curricula and their frequency according to the course of origin, with emphasis on terms related to teaching.

NURSING		**PHARMACY**		**NUTRITION**	
Term	**Freq.**	**Term**	**Freq.**	**Term**	**Freq.**
health	22	health	22	nutrition	31
research	18	science	18	method	14
nursing	14	molecular	18	special_topics	9
care	13	method	16	clinic	8
management	8	research	12	biochemistry	8
methodology	8	methodology	11	planning	8
basis	7	special_topics	11	practical	7
scientist	7	seminar	11	food	7
method	6	topic	11	teaching	6
practical	5	pharmacist	10	metabolism	6
teaching_practice	5	pharmacology	9	nutritional	6
politician	4	chemical	8	epidemiological	5
clinic	4	biology	8	feeding	5
teaching	4	analysis	8	health	4
superior	4	basis	6	research	4

Source: Author.

Table 2 - CONTINUATION.

DENTISTRY		PUBLIC HEALTH	
Term	**Freq.**	**Term**	**Freq.**
dentistry	26	health	49
applied	11	analysis	21
scientific	9	method	19
buccal	6	research	18
health	5	politician	15
methodology	5	social	15
management	4	public_health	14
diagnosis	4	politics	12
redaction	4	public	12
oral	4	management	11
planning	3	epidemiological	11
teaching_practice	3	planning	10
internship	3	process	8
method	2	culture	8
clinic	2	information	7

Source: Author.

This excessive emphasis on research found in course curricula can create a gap in the training of future teachers, who often face challenges when starting their careers as educators without a solid basis in pedagogical education (PIVETTA et al., 2019; ARAÚJO, 2022). Therefore, investing in the pedagogical training of health professionals is essential to ensure that future professionals in this field receive quality education and are well-prepared to practice their profession (MENEGAZ et al., 2013; VERÇOSA; LIMA, 2019).

However, the importance of research within the university should not be undermined, as the production of scientific knowledge is of paramount importance to society as a whole. What is criticized is the division between the roles of teacher and researcher, considering that both branches can and should go hand in hand to complement each other and lead to more effective processes of knowledge production and teaching-learning within the university (CASTANHO, 2005; VIEIRA; ARAÚJO; VÉRAS, 2015).

A practical example of this integration would be that research can provide students with an active and participatory learning environment, in which students are directly involved in knowledge production and contribute to society. Consequently, students have

the opportunity to apply the theoretical concepts learned in the classroom, work in teams, and develop investigative skills, thereby consolidating classroom teaching (ELLERY; BOSI; LOIOLA, 2013; HEALEY; JEANKINS; LEA, 2014).

Measures such as the increased inclusion of specific subjects on didactics and teaching practices in curricula, the promotion of teacher training programs, and the encouragement of valuing teaching in the academic career are paths to be considered (FERENC; SARAIVA, 2010; VERÇOSA; LIMA, 2019). In this way, future health teachers can not only master their research fields but also be trained to competently engage in teaching, conveying knowledge clearly and efficiently.

It is the responsibility of the academic community to seek ways to value the teaching-learning process (CÔRREA; RIBEIRO, 2013a; 2013b), even if tangible results are not achieved in the short term, but that bring long-term success in shaping individuals who pass through the university (VERÇOSA; LIMA, 2019; OLIVEIRA; RIBEIRO, 2020). Thus, teaching can be seen as a fundamental part of academic education and be appropriately valued and encouraged within this environment.

It is worth noting that reversing this trend of overemphasizing research at the expense of teaching requires a paradigm shift not only in the academic sphere but also in the broader structure of society. This problem is also a reflection of the pressure for immediate results, the encouragement of excessive competition, and the relentless pursuit of financial returns in contemporary society, which permeates and affects academic institutions (MAGALHÃES, 2013).

It is also the responsibility of the State to promote this transformation by adopting measures and policies that encourage the appreciation of teaching, with investments that provide more favorable conditions for the development of this field. This includes the allocation of funds for the pedagogical training of teachers, the improvement of physical spaces in universities, and the acquisition of educational and technological materials (MOLINA; RODRIGUES, 2020).

In summary, the analysis of the curriculum components of postgraduate courses in the health field conducted in this study revealed a concerning finding: the predominance of terms related to research over those related to teaching. This result confirms the lack of focus on the development of pedagogical competencies and the training of professionals capable of working as teachers in the field of health, reflecting the overvaluation of research in the academic environment as a whole.

FINAL CONSIDERATIONS

This study examined the curriculum components of postgraduate health courses in a public university and found that the main terms present were primarily related to research, with a lack of emphasis on teaching-related terms, confirming the lack of focus in this area within fields such as healthcare.

The main justification for this finding was seen as a reflection of the overemphasis on research within the academic community, as evidenced by the analyzed curriculum components. Furthermore, the results of this study reinforce the need for a revision of postgraduate curricula to include curriculum components that promote the development of pedagogical competencies.

Greater investment from both educators and educational institutions in this subject is also necessary to promote a more comprehensive and qualified education for healthcare professionals aspiring to pursue a teaching career. Additionally, there is a need for a

paradigm shift away from the overvaluation of research at the expense of teaching, involving academia, government, and society as a whole.

ACKNOWLEDGMENTS
I would like to express my gratitude to Professor Dr. Otilia Maria Alves da Nobrega Alberto Dantas for inspiring me to conceive this present work. Furthermore, I am grateful for being an exceptional mentor and teacher who has transformed my mind and way of thinking about teaching in a peaceful, friendly, soft and elegant manner.

REFERENCES

ARAÚJO, F.J.S. A prática docente no ensino superior: perspectivas e desafios. **Revista do Programa Nacional de Formação de Professores da Educação Básica Universidade Federal do Piauí**, v.10, n. 5-12, p.4, jan. / jun. 2022.

CASTANHO, S. Ensino com pesquisa na graduação. In: VEIGA, I. P. A.; NAVES, M. L. P. (orgs.). **Currículo e avaliação na educação superior.** Araraquara: Junqueira&Marin, 2005, pp. 79-96.

CORRÊA, G.T.; RIBEIRO, V.M.B. A formação pedagógica no ensino superior e o papel da pós-graduação *stricto sensu*. **Educ. Pesqui.**, v. 39, n. 2, p. 319–334, 1 jun. 2013a.

CORRÊA, G.T.; RIBEIRO, V.M.B. Formação pedagógica na pós-graduação *stricto sensu* em saúde coletiva. **Ciênc. saúde coletiva**, v. 18, n. 6, p. 1647–1656, 2013b.

DIAS, A. M. I. Discutindo caminhos para a indissociabilidade entre ensino, pesquisa e extensão. **Revista Brasileira de Docência, Ensino e Pesquisa em Educação Física**, v. 1, n. 1, p. 37-52, 2009.

ELLERY, A. E. L.; BOSI, M. L. M.; LOIOLA, F. A. Integração ensino, pesquisa e serviços em saúde: antecedentes, estratégias e iniciativas. **Saúde e Sociedade**, v. 22, n. 1, p. 187–196, jan. 2013.

FERENC, A. V. F.; SARAIVA, A. C. L. C. Os professores universitários, sua formação pedagógica e suas necessidades formativas. **Ensino Superior: convergências e tensões no campo da formação e do trabalho docente.** Belo Horizonte: Ed. Autêntica, p. 573-589, 2010.

FIGUEREDO, W.N.; LAITANO, A.C.; SANTOS, V.P.F.A.; DIAS, A.C.S.; SILVA, G.T.R.; TEIXEIRA, G.A.S. Formação didático-pedagógica na pós-graduação *stricto sensu* em Ciências da Saúde nas Universidades Federais do Nordeste do Brasil. **Acta Paul Enferm.**, v. 30, n. 5, 2017.

HEALEY, M.; JEANKINS, A.; LEA, J. Developing research-based curricula incollege-based higher education. **The Higher Education Academy**, 2014.

KETELE, J. M. La formación didáctica y pedagógica de los profesores universitarios: luces y sombras. **Revista de Educación**, n. 331, p. 146–169, 2003.

MANHÃES, L.S.P. **Contribuições da pós-graduação stricto sensu para a formação docente do enfermeiro**. 2020. Tese (Doutorado) - Universidade Federal Fluminense, Niterói, 2020.

MAGALHÃES, S. M. O. Trabalho, pesquisa e ensino: tensões e desafios para a docência no ensino superior. **Psicol. Ensino & Form.**, Brasília , v. 4, n. 1, p. 60-78, 2013.

MASSETO, M. T. **Competência pedagógica do professor universitário.** 2. ed. São Paulo: Summus, 2012.

MENEGAZ, J. C.; BACKES, V.M.S.; CUNHA, A.P.; FRANCISCO, B.S. O bom professor na área da saúde: uma revisão integrativa da literatura. **Saúde & Transformação Social**, v. 4, n. 4, p. 92-99, 2013.

MOLINA, A. A.; RODRIGUES, A. A. Estado, Políticas Públicas e Formação Docente no Brasil: direcionamentos a partir do início do século XXI. **Ensino em Re-Vista**, Uberlândia , v. 27, n. 1, p. 40-67, jan. 2020 .

NUNES, E. D.; FERRETO, L. E.; BARROS, N. F.. A pós-graduação em Saúde Coletiva no Brasil: trajetória. **Ciência & Saúde Coletiva**, v. 15, n. 4, p. 1923–1934, jul. 2010.

OLIVEIRA, A.G.; RIBEIRO, M. F. M. Formação para a docência na pós-graduação em ciências biológicas e da saúde: uma autoavaliação. **Revista Brasileira de Pós-Graduação**, v. 16, n. 36, p. 1–43, 2020.

PIMENTA, S. G.; ANASTASIOU, L. G. C. **Docência no ensino superior.** 5. ed. São Paulo: Cortez, 2014.

PIVETTA, H. M. F.; SCHLEMEER, N.; ROVEDA, P.O.; ISAIA, S.M.A.; POROLNIK, S.; COCCO, V.M.. Setbacks of university teaching in health sciences. **Educação e Realidade**, v. 44, n. 1, p. 1–19, 2019.

RIBEIRO, O.; SCHERRE, P. P.. Ensino, pesquisa e extensão na formação de professores: ressignificando o princípio essencial da indissociabilidade. In: NOVAES, M. A. B.; LIMA, M. T. T.; OLIVEIRA, R. V.; OLIVEIRA, Diana Nara da Silva. **Ensino, pesquisa e extensão na formação de professores.** 1. ed. Ceará: Quipá Editora, 2022. cap. 5.

SALVIATI, M. **Manual do Aplicativo Iramuteq.** IRAMUTEQ, 2017. Disponível em: http://www.iramuteq.org/documentation/fichiers/manual-do-aplicativo-iramuteq-par-maria-elisabeth-salviati.

SILVA, V.O.; PINTO, I.C.M. Produção científica sobre docência em saúde no Brasil. **Saúde em Debate**, v. 43, p. 134-147, 2019.

VERÇOSA, R. C. M.; LIMA, L. V. da S. Formação para a Docência no Ensino Superior do Profissional de Saúde. **Revista de Ensino, Educação e Ciências Humanas**, v. 20, n. 3, p. 286–291, 2019.

VIEIRA, C.M.B.; ARAÚJO, R.A.Q.; VÉRAS, R.M. REUNI e a formação acadêmica dos estudantes de saúde da UFBA: componentes curriculares, pesquisa e extensão. **Revista GUAL**, Florianópolis, v. 8, n. 4, p. 01-19, Edição Especial. 2015

Chapter 5

VITAMIN B12 AND NEUROPATHOLOGY: REGENERATIVE OR NEUROPROTECTIVE ROLE?

Ananda Almeida Santana Ribeiro, Natalia de Jesus Santos, Mayara Pereira Santos Souza.

Abstract: Among the complications of diabetes, a group of clinical syndromes caused by damage to the peripheral and autonomic nervous systems are by far the most prevalent. The aim of this summary is to characterize the main existing evidence on the effectiveness of vitamin B12 supplementation for the treatment of diabetic peripheral neuropathy. For this, it is an integrative review, of scope, based on a meta-analytic analysis of works found in the literature. Based on the results found, it can be stated that vitamin B12 deficiency is associated with multiple neurological and neurocognitive manifestations, including peripheral and autonomic neuropathy. Finally, such results imply the importance of studying the use of B12 for application in peripheral neuropathy, given that a significant part of the Brazilian population suffers from the symptoms of this pathology.

Keywords: Diabetes. B12 vitamin. Neuropathies.

A. A. S. Ribeiro Universidade Federal de Sergipe. São Cristóvão, SE, Brasil.
e-mail: anandaalmeidasant@hotmail.com.

N. de J. Santos UniAges. Paripiranga, BA, Brasil.

M. P. S. Souza .UniAges. Paripiranga, BA, Brasil.

INTRODUCTION

Among the complications of diabetes, a group of clinical syndromes caused by damage to the peripheral and autonomic nervous systems are by far the most prevalent. Often referred to as different forms of neuropathy, these syndromes are caused by both diffuse and focal damage to the nervous system and occur in up to half of all individuals with diabetes (DI LORENZI et al., 2020).

Vitamin B12 deficiency is a known adverse effect of chronic metformin use, which was first described by Berchtold et al. in 1969, demonstrated in several studies since then (DELI et al., 2014). The prevalence of vitamin B12 deficiency in patients taking metformin ranges from 5 to 40% in different populations (DELI et al., 2014).

Vitamin B12 deficiency is associated with multiple neurological and neurocognitive manifestations, including peripheral and autonomic neuropathy, combined subacute spinal cord degeneration, delirium, dementia, and axonal demyelination (ANDRÈS et al., 2004; OKAD et al., 2010; JURNA, 1998).

DEVELOPMENT

Vitamin B12 acts on many organs and systems in the human body. Because of the systemic action of cobalamin (Cbl), a state of Cbl deficiency (Cbl-D) is repeated as numerous symptoms, more or less severe, throughout the body (COZZOLINO, 2007). Conventionally, symptoms are different between inherited disorders in which Cbl deficiency occurs at birth or in youth and acquired disorders that affect adults as well, and also, research reports negative effects of a Cbl-D deficit state when it develops during adolescence. fetal development of the individual (COZZOLINO, 2007). However, this summary focuses on the direct evaluation of the nervous system, the direct objective of this study.

In the central nervous system (CNS), the histopathological features of neuropathy due to Cbl deficiency are: (i) a diffuse but patchy vacuolization (called spongiform vacuolation) of white matter (especially the spinal cord) that affects posterior SC columns or sides along its entire length; (ii) intramyelin and interstitial edema of the white matter of the CNS (especially the SC); and (iii) reactive astrogliosis (VARELA-MOREIRAS; MURPHY; SCOTT, 2009). The most consistent MRI finding is an abnormally increased symmetric T2 signal intensity. This abnormality is related to demyelination or intramyelin edema and is confined to the posterior or posterior and lateral columns in the cervical and thoracic SC (VARELA-MOREIRAS; MURPHY; SCOTT, 2009). In acute and severe cases, CS can also present as edema, and anterior column involvement was also occasionally reported in study Mattson's; Shea (2003).

Histopathological lesions, similar to those of the Central Nervous System (CNS), were observed more rarely in the white matter of the brain, that is, leukoencephalopathy (VARELA-MOREIRAS; MURPHY; SCOTT, 2009). In some patients, fluid-attenuated inversion recovery and T2-weighted images demonstrate extensive areas of a high-intensity signal in the periventricular white matter. Studies have also investigated a low Cbl status as a modifiable cause of brain atrophy (REYNOLDS, 2006).

Peripheral neuropathy (also called polyneuropathy) is another major neuropathological consequence of Cbl deficiency. The histopathological and ultrastructural hallmarks are intramyelin and interstitial edema and gliosis. Cbl deficiency

also leads to electrophysiological abnormalities in the peripheral nervous system (VARELA-MOREIRAS; MURPHY; SCOTT, 2009; REYNOLDS, 2006).

In the CNS and peripheral nervous system, myelin sheaths appear to be more severely involved than axons, and no myelin-depleted axons or any ultrastructural evidence of new myelin deposition occurring simultaneously with myelin lysis was observed. ; MURPHY; SCOTT, 2009; REYNOLDS, 2006). Only the optic nerve fibers are often spared in patients with neuropathy due to Cbl deficiency. Neurons do not appear to be structurally affected by Cbl deficiency. With reference to the aforementioned subject, some authors have classified neuropathy due to Cbl deficiency as a pure myelinolytic disease without apparent myelin loss (VARELA-MOREIRAS; MURPHY; SCOTT, 2009). Furthermore, no histopathological signs of inflammation or apoptosis were observed in the Central Nervous System of patients who died with Cbl-D neuropathy (VARELA-MOREIRAS; MURPHY; SCOTT, 2009; REYNOLDS, 2006).

Typical neurological manifestations of neuropathy due to Cbl deficiency are: (i) myelopathy with or without associated neuropathy; (ii) optic neuropathy; and (iii) paresthesias without abnormal signs (VARELA-MOREIRAS; MURPHY; SCOTT, 2009). Optic neuropathy occurs only occasionally in adult patients. Optic nerve disease is characterized by painless, progressive, symmetrical visual loss. Central and centrocecal scotomas are the main ophthalmological findings (REYNOLDS, 2006).

Neurologic features often include a spastic paraparesis or tetraparesis, extensor plantar response, and impaired position and vibration perception. The involvement of the posterior and lateral columns of the cervical and upper dorsal parts of the CL is responsible for the impairment of the sense of position, paraparesis and tetraparesis (FÁBREGAS; VITORINO; TEIXEIRA, 2011). Almost all patients have loss of vibratory sensation, often associated with decreased proprioception and skin sensation and Romberg's sign (FÁBREGAS; VITORINO; TEIXEIRA, 2011).

Neuropsychiatric manifestations of Cbl deficiency include personality change, psychosis, emotional instability and, rarely, delirium or coma. Reported symptoms of psychosis include suspiciousness, persecutory or religious delusions, auditory and visual hallucinations, and disorganized thought processes (VARELA-MOREIRAS; MURPHY; SCOTT, 2009; REYNOLDS, 2006; FÁBREGAS; VITORINO; TEIXEIRA, 2011).

In short, it is perceived that the implications are many, and also directly lead to diabetic peripheral neuropathy, as revisited in the studies presented.

FINAL CONSIDERATIONS

Although understanding of the complexities of diabetic neuropathy has evolved substantially over the past decade, the distinct mechanisms underlying neuropathy in type 1 and type 2 diabetes remain unknown, and future discoveries regarding the pathogenesis of the disease are crucial to successfully addressing all aspects of neuropathy. diabetes in both prevention and treatment.

Research such as that by Andrès et al. (2004), Okad et al. (2010) and Jurna (1998) have contributed to a possible alignment of researchers regarding the use of B12 in neuropathies. However, large projects, on randomized scales, were not observed in view of the study of peripheral neuropathies, which suggests further studies on this topic.

AGRADECIMENTOS

I thank God for giving me the chance to come this far and complete this work. I would like to thank everyone who directly or indirectly took part in this work, especially Natalia and Mayara, colleagues in the profession and scientific production.

REFERENCES

BRINATI, Lídia Miranda et al. Prevalence and factors associated with peripheral neuropathy in individuals with diabetes mellitus. **Revista de Pesquisa: Cuidado é Fundamental Online**, v. 9, n. 2, p. 347-355, 2017.

DELI, Gabriella et al. Diabetic neuropathies: diagnosis and management. **Neuroendocrinology**, v. 98, n. 4, p. 267-280, 2014.

DI LORENZI, Roberto et al. Prevalencia de neuropatía periférica en una Unidad de Diabetes. **Revista Uruguaya de Medicina Interna**, v. 5, n. 2, p. 17-27, 2020.

ENGERMAN, R. L.; KERN, T. S.; LARSON, M. E. Nerve conduction and aldose reductase inhibition during 5 years of diabetes or galactosaemia in dogs. **Diabetologia**, v. 37, p. 141-144, 1994.

FÁBREGAS, Bruno Cópio; VITORINO, Flávia Domingues; TEIXEIRA, Antônio Lucio. Deficiência de vitamina B12 e transtorno depressivo refratário. **Jornal Brasileiro de Psiquiatria**, v. 60, p. 141-143, 2011.

GRIEBELER, Marcio L. et al. Pharmacologic interventions for painful diabetic neuropathy: an umbrella systematic review and comparative effectiveness network meta-analysis. **Annals of internal medicine**, v. 161, n. 9, p. 639-649, 2014.

GROPPER, Sareen Annora Stepnick; SMITH, Jack L.; GROFF, James L. **Nutrição avançada e metabolismo humano**. Cengage Learning, 2012.

IBGE. **Instituto Brasileiro de Geografia e Estatística**. Diabetes. Portal Brasil. Disponível em: http://www.brasil.gov.br/saude/2015/07/diabetes-atinge-9-milhoes-de-brasileiros. Acesso em 29 ago. 2021.

MATTSON, Mark P.; SHEA, Thomas B. Folate and homocysteine metabolism in neural plasticity and neurodegenerative disorders. **Trends in neurosciences**, v. 26, n. 3, p. 137-146, 2003.

MORALES-VIDAL, Sarkis et al. Diabetic peripheral neuropathy and the management of diabetic peripheral neuropathic pain. **Postgraduate medicine**, v. 124, n. 4, p. 145-153, 2012.

POMPEU, F. **Neuropatia diabética.** In: Arduino F, editor. Diabetes Mellitus. Rio de Janeiro: Editora Guanabara-Koogan, 1980.

REYNOLDS, Edward. Vitamin B12, folic acid, and the nervous system. **The lancet neurology**, v. 5, n. 11, p. 949-960, 2006.

SIMMONS, Zachary; FELDMAN, Eva L. Update on diabetic neuropathy. **Current opinion in neurology**, v. 15, n. 5, p. 595-603, 2002.

SMITH, A. Gordon; SINGLETON, J. Robinson. Diabetic neuropathy. **Continuum: lifelong learning in neurology**, v. 18, n. 1, p. 60-84, 2012.

VARELA-MOREIRAS, Gregorio; MURPHY, Michelle M.; SCOTT, John M. Cobalamin, folic acid, and homocysteine. **Nutrition reviews**, v. 67, n. suppl_1, p. S69-S72, 2009.

SANTOS, Isabel Cristina Ramos Vieira et al. **Atenção à saúde do portador de pé diabético: prevalência de amputações e assistência preventiva na Rede Básica de Saúde.** 2008. Tese de Doutorado.

WOOLF, Clifford J.; MANNION, Richard J. Neuropathic pain: aetiology, symptoms, mechanisms, and management. **The lancet**, v. 353, n. 9168, p. 1959-1964, 1999.

Research and Practices in the Health Sciences

ISBN: 978-65-85105-09-5

Organizadoras:
Tatiane Pereira Scarpelli
Eliza Carminatti Wenceslau

Editoração:
Maxwell Luiz da Ponte

Reconecta Soluções Educacionais
CNPJ 35.688.419/0001-62
Rua Silva Jardim, 1329 – Parque Industrial.
Fone: (17) 99175-6641. Website: reconectasolucoes.com.br
contato@reconectasolucoes.com.br