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FACTORS ASSOCIATED WITH BIOLOGICAL MATERIAL EXPOSURE ACCIDENTS: SCOPING REVIEW PROTOCOL

FATORES ASSOCIADOS AOS ACIDENTES COM MATERIAL BIOLÓGICO: PROTOCOLO DE REVISÃO DE ESCOPO

FACTORES ASOCIADOS A LOS ACCIDENTES CON MATERIAL BIOLÓGICO: PROTOCOLO DE REVISIÓN DE ALCANCE

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Submission: 27-06-2024
Approval: 20-02-2025

ABSTRACT
Objective: To map and analyze work-related aspects and individual factors associated with accidents involving biological material among healthcare professionals in hospital settings. **Methods:** Scoping review protocol guided by the JBI method, based on the guiding question: "What are the work-related aspects and individual factors associated with accidents involving accidental exposure to biological material in the hospital environment?". The searches will take place in the LILACS, BDENF and other VHL databases, MEDLINE/Pubmed, CINAHL, Embase, Scopus, Web of Science and others from the CAPES Periodicals Portal and Epistemonikos. The languages used will be English, Portuguese and Spanish, with a time frame of the last 5 years. Studies on accidents involving biological material in health professionals will be included; and those involving primary care professionals, without clear methodology, case reports, expert opinion, review studies and gray literature will be excluded. The Rayyan system will be used to select by title and abstract and full text. The results will be presented in tables, graphs and narrative form. **Results:** The results of this review will make it possible to understand, from a global perspective, aspects related to the work of health professionals that precede biological material in order to disseminate evidence that has been little explored in the scientific literature. **Conclusion:** We hope to identify studies that highlight work-related aspects and individual factors that precede accidents involving biological material.
Keywords: Accidents, Occupational; Health Personnel; Hazardous Substances.

RESUMEN
Objetivo: Mapear y analizar los aspectos laborales y los factores individuales asociados a los accidentes con material biológico entre los profesionales sanitarios en el ámbito hospitalario. **Métodos:** Protocolo de revisión scoping guiado por el método JBI, a partir de la pregunta guía: "¿Cuáles son los aspectos laborales y los factores individuales asociados a los accidentes por exposición accidental a material biológico en el medio hospitalario?". Las búsquedas se realizarán en las bases de datos LILACS, BDENF y otras de la BVS, MEDLINE/Pubmed, CINAHL, Embase, Scopus, Web of Science y otras del Portal de Publicaciones Periódicas de CAPES y Epistemonikos. Los idiomas utilizados serán inglés, portugués y español, con un marco temporal de los últimos 5 años. Se incluirán los estudios sobre accidentes con material biológico en profesionales sanitarios; se excluirán los que afecten a profesionales de atención primaria, sin metodología clara, informes de casos, opinión de expertos, estudios de revisión y literatura gris. Se utilizará el sistema Rayyan para seleccionar por título y resumen y texto completo. Los resultados se presentarán en tablas, gráficos y forma narrativa. **Resultados:** Los resultados de esta revisión permitirán conocer, desde una perspectiva global, aspectos relacionados con el trabajo de los profesionales sanitarios que preceden al material biológico con el fin de difundir evidencias poco exploradas en la literatura científica. **Conclusión:** Esperamos identificar estudios que pongan de relieve los aspectos relacionados con el trabajo y los factores individuales que preceden a los accidentes con material biológico.
Palabras-clave: Accidentes de Trabajo; Personal de Salud; Sustancias Peligrosas.

RESUMO
Objetivo: Mapear os aspectos relacionados ao trabalho e fatores individuais associados ao acidente com material biológico em profissionais da saúde no ambiente hospitalar. **Métodos:** Protocolo de revisão de escopo orientado pelo método JBI, a partir da pergunta norteadora: “quais são os aspectos relacionados ao trabalho e os fatores individuais associados aos acidentes com exposição acidental com material biológico no ambiente hospitalar?”. As buscas ocorrerão nas bases de dados LILACS, BDENF e outras da BVS, MEDLINE/ Pubmed, CINAHL, Embase, Scopus, Web of Science e outras do Portal de Periódicos da CAPES e Epistemonikos. Serão utilizados os idiomas: inglês, português e espanhol, com recorte temporal dos últimos 05 anos. Serão incluídos os estudos sobre acidente com material biológico em profissionais de saúde; e excluídos aqueles com profissionais da atenção primária, sem metodologia clara, relatos de caso, opinião de especialistas, estudos de revisão e literatura cinzenta. O sistema Rayyan será utilizado para seleção por título e resumo e texto completo. Os resultados serão apresentados em tabelas, gráficos e de forma narrativa. **Resultados:** Os resultados desta revisão permitirão compreender, em perspectiva global, sobre os aspectos relacionados ao trabalho do profissional de saúde que antecedem ao material biológico para divulgação de evidências poucos exploradas na literatura científica. **Conclusão:** Espera-se identificar estudos que evidenciem aspectos relacionados ao trabalho e fatores individuais que antecedem o acidente com material biológico.
Palavras-chave: Acidentes de Trabalho; Pessoal de Saúde; Substâncias Perigosas.

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INTRODUCTION

Accidents involving exposure to biological material are defined as accidental contact with blood and bodily fluids in the workplace. These accidents can occur through three types of exposure, namely: 1) Percutaneous exposure—resulting from needle sticks or sharp object injuries; 2) Mucous membrane exposure—involving direct contact with blood and/or bodily fluids in the ocular, nasal, and oral mucosa; and 3) Exposure to non-intact skin—involving contact with areas where the skin exhibits dermatitis or open wounds[1].

Global data indicates that among 35 million healthcare professionals, approximately three million experience accidents involving biological material annually, resulting in 16,000 infections caused by Hepatitis C virus (HCV), 66,000 by Hepatitis B virus (HBV), and 1,000 by acquired immunodeficiency syndrome (AIDS), stemming from accidents with contaminated sharps[2].

In Brazil, the numbers are also significant, as evidenced by the National Institute of Social Security, which reported 40,972 accidents between 2015 and 2017, confirming an annual increase in the number of workplace accidents involving exposure to potentially hazardous biological materials (PHBM)[3].

Given the severity of these accidents, from an epidemiological standpoint, there has been a substantial increase in the number of studies on this topic over the past decades. This has allowed for a better understanding of the causes, circumstances, and characteristics of the accidents; the biological consequences; the most affected work regimes; the economic and social impact; the bloodborne pathogens transmitted by sharps; the highest risk occupational group; the instruments involved; the importance of using personal protective equipment (PPE); and the occurrence of underreporting[3].

However, despite the relevance of the topic and the interest of several countries, there is a scarcity of studies on accidents involving biological material that investigate their causal link with aspects related to the work experienced by these professional[4], such as unit overcrowding, insufficient human and material resources, inadequate physical facilities, multiple shifts and work overload, night shifts, sleep deprivation, and the need to perform various tasks in reduced time[5].

Even though healthcare professionals exhibit high levels of occupational burnout, there is still a scarcity of studies investigating the individual factors present in injured professionals, such as drowsiness, fatigue, lack of concentration, stress, and emotional exhaustion from daily contact with pain, suffering, and death[5].

Given the risks to which healthcare professionals are exposed, studies evaluating work-related aspects and individual factors that may be associated with the risk of accidents involving biological material are necessary, as the work context directly influences individuals' thoughts, behavior, and physical reactions. Thus,

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workers apply conscious and unconscious behaviors to meet work demands, which can cause harm not only to the patient but also to themselves through accidental exposure to biological material[6].

Given these vulnerabilities, it is necessary to address this topic to ensure greater safety and support regarding preventive measures for these professionals. Therefore, this research serves as a relevant instrument for investigating the control of occupational health hazards.

In this sense, this review aims to map and analyze the work-related aspects and associated individual factors that lead healthcare professionals to accidents involving biological material in the hospital setting. The research question is: What are the work-related aspects and individual factors associated with accidents involving accidental exposure to biological material in the hospital setting?

MATERIALS AND METHODS

This scoping review protocol follows the methodological recommendations of Chapter 11 – Scoping Review of the JBI Manual for Evidence Synthesis[7] and the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA)[8]. The protocol was registered in the Open Science Framework (OSF) on September 4, 2023, and can be accessed via DOI https://doi.org/10.17605/OSF.IO/WQ68K.

The research question was formulated as: "What are the work-related aspects and individual factors associated with accidents involving accidental exposure to biological material in the hospital setting?"

Inclusion Criteria

Studies addressing healthcare professionals who experienced accidents with biological material, without limitations related to participants, will be included. According to the World Health Organization, healthcare professionals are defined as individuals working with actions aimed at improving and caring for the health of a given population[9].

The research concept will be broad, seeking to map in the literature the work-related aspects such as (location, lighting, temperature, equipment, physical exertion, division of labor, task content, hierarchy, and number of hours worked)[10]. For individual factors, fatigue, exhaustion, stress, suffering, anxiety, depression, and others associated with work accidents involving accidental exposure to biological material in the hospital setting will be investigated. A work accident is considered an unexpected and unplanned occurrence that results in personal injury, illness, or death of one or more workers[11].

Search Strategy

The search strategy will be conducted in three stages: A preliminary search will be performed in the MEDLINE®/PubMed, OSF, JBI Synthesis, Prospero, and Cochrane Library databases to identify studies for inclusion and determine if there are scoping reviews, systematic reviews, and primary studies for

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mapping, as well as to establish relevant search terms for the definitive strategy.

The second phase refers to the post-definition of the search strategy for application and adaptation in the selected databases from the following sources: MEDLINE/PubMed; EMBASE and SCOPUS/Elsevier; CINAHL; LILACS, BDENF/Virtual Health Library; and Web of Science Core Collection/Clarivate Analytics. The third phase refers to the search for additional studies in the reference lists of all publications included in the review.

For this research, keywords and terms found in articles associated with the theme will be used, as available in Table 1.

Table 1 – Search strategy.

Source	Strategy
MEDLINE/PubMed	("Health Personnel"[mh] OR "Health Personnel"[tiab] OR Health Care Provider*[tiab] OR Healthcare Provider*[tiab] OR Healthcare Worker*[tiab] OR Health Care Professional*[tiab] OR Health Professional*[tiab] OR "healthcare professional"[tiab] OR "Physicians"[mh] OR Physician*[tiab] OR "Nurses"[mh] OR Nurse[tiab] OR Nursing*[tiab] OR "Nursing"[mh] OR "Physical Therapists"[mh] OR "Physical Therapist"[tiab] OR Physiotherapist*[tiab] OR "Occupational Therapy"[mh] OR "Occupational Therapy"[tiab] OR "Speech and Hearing"[tiab] OR "Speech-Language Pathology and Audiology"[tiab] OR "hospital workers"[tiab] OR "staff working"[tiab] OR "Medical Staff, Hospital Attending Physician*[tiab] OR Hospital Medical Staff*[tiab] OR "Nursing Assistants"[mh] OR Nurse Aide*[tiab] OR Nursing Assistant*[tiab] OR Nursing Auxiliar*[tiab]) AND ("Needles"[mh] OR
EMBASE	Accident*[tiab] OR "Occupational Exposure"[mh] OR Occupational Exposure*[tiab] OR "Occupational Diseases"[mh] OR Occupational Disease[tiab] OR Occupational Illnesse*[tiab] OR Occupational Risk*[tiab] OR Insecure Labor Condition*[tiab] OR "Work Risk"[tiab] OR "Occupational Health"[mh] OR "Occupational Health"[tiab] OR "Employee Health"[tiab] OR "Occupational Safety"[tiab])("Hospitals"[mh] OR Hospital*[tiab] OR "Hospital Units"[mh] OR Hospital Unit*[tiab])
CINAHL	"Occupational Stress"[mh] OR "Occupational Stress"[tiab] "Job related Stress"[tiab] OR "Job Stress"[tiab] OR "Job Stresses"[tiab] OR "Job-related Stress"[tiab] OR "Job-related Stresses"[tiab] OR "Occupational

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	Stresses"[tiab] OR Professional Stress*[tiab] OR Work Place Stress*[tiab] OR Work related Stress*[tiab] OR Work-related Stress*[tiab] OR "Workplace Abuse"[tiab] OR "Workplace Bullying"[tiab] OR Workplace Stress*[tiab] OR "Stress, Psychological"[mh] OR Life Stress*[tiab] OR Psycholog* Stress[tiab] OR Psychological Stress*[tiab] OR "Accidents, Occupational"[mh] OR Industrial Accident[tiab] OR Occupational Needle*[tiab] OR "Needlestick Injuries"[mh] OR "Needlestick Injuries"[tiab] OR Needle Stick*[tiab] OR Needle-Stick*[tiab] OR Needlestick*[tiab] OR Sharps Injur*[tiab] OR "Wounds, Stab"[mh] OR Stab Wound*[tiab] OR Sharp*[tiab] OR "Containment of Biohazards"[mh]
SCOPUS	Needle*[tiab] OR "Needlestick Injuries"[mh] OR "Needlestick Injuries"[tiab] OR Needle Stick*[tiab] OR Needle-Stick*[tiab] OR Needlestick*[tiab] OR Sharps Injur*[tiab] OR "Wounds, Stab"[mh] OR Stab Wound*[tiab] OR Sharp*[tiab] OR "Containment of Biohazards"[mh]"Infection Control"[mh] OR "Infection Control"[tiab] OR Medical Waste*[tiab] OR Pathological Waste*[tiab]) AND ("Containment of Biohazards"[mh] OR Biohazard* Containment[tiab] OR Biologic* Containment[tiab] OR Biosafety[tiab] OR "Physical Containment"[tiab] OR "Hazardous Waste"[mh] OR Hazardous Wast*[tiab] OR "Infectious Disease Transmission, Patient-to-Professional"[mh] OR "Patient to Professional Transmission"[tiab] OR "Patient-to-Professional Transmission"[tiab] OR "Infection Control"[mh] OR "Infection Control"[tiab] OR Medical Waste*[tiab] OR Pathological Waste*[tiab] OR "Accident Prevention"[mh] OR "Accident Prevention"[tiab] OR "Personal Protective Equipment"[mh] OR Personal Protective Equipment*[tiab]
LILACS	Needle*[tiab] OR "Needlestick Injuries"[mh] OR "Needlestick Injuries"[tiab] OR Needle Stick*[tiab] OR Needle-Stick*[tiab] OR Needlestick*[tiab] OR Sharps Injur*[tiab] OR "Wounds, Stab"[mh] OR Stab Wound*[tiab] OR Sharp*[tiab] OR "Containment of Biohazards"[mh] OR Biohazard* Containment[tiab] OR Biologic* Containment[tiab] OR Biosafety[tiab] OR "Physical Containment"[tiab] OR "Hazardous Waste"[mh] OR Hazardous Wast*[tiab] OR "Infectious Disease Transmission, Patient-to-Professional"[mh] OR "Patient to Professional Transmission"[tiab] OR "Patient-to-Professional Transmission"[tiab]

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BDENF	Pharmac*[tiab] OR "Nutritionists"[mh] OR Nutritionist*[tiab] OR Dietician*[tiab] OR Dietitian*[tiab] OR "Patient Care Team"[mh] OR Patient Care Team*[tiab] OR Medical Care Team*[tiab] OR Interdisciplinary Health Team*[tiab] OR Healthcare Team*[tiab] OR Health Care Team*[tiab] OR "Medical Staff"[mh] OR "Medical Staffs"[tiab] OR "Hospital staff"[tiab] OR "health worker"[tiab] OR "clinical work"[tiab] OR doctor*[tiab] OR "hospitality workers"[tiab] Needle*[tiab] OR "Needlestick Injuries"[mh] OR "Needlestick Injuries"[tiab] OR Needle Stick*[tiab] OR Needle-Stick*[tiab] OR Needlestick*[tiab] OR Sharps Injur*[tiab] OR "Wounds, Stab"[mh] OR Stab Wound*[tiab] OR Sharp*[tiab] OR "Containment of Biohazards"[mh]
Cochrane	"Social Workers"[mh] OR "Social Worker"[tiab] OR "Pharmacy"[mh] OR Pharmac*[tiab] OR "Nutritionists"[mh] OR Nutritionist*[tiab] OR Dietician*[tiab] OR Dietitian*[tiab] OR "Patient Care Team"[mh] OR Patient Care Team*[tiab] OR Medical Care Team*[tiab] OR Needle*[tiab] OR "Needlestick Injuries"[mh] OR "Needlestick Injuries"[tiab] OR Needle Stick*[tiab] OR Needle-Stick*[tiab] OR Needlestick*[tiab] OR Sharps Injur*[tiab] OR "Wounds, Stab"[mh] OR Stab Wound*[tiab] OR Sharp*[tiab] OR "Containment of Biohazards"[mh] Interdisciplinary Health Team*[tiab] OR Healthcare Team*[tiab] OR Health Care Team*[tiab] OR "Medical Staff"[mh] OR "Medical Staffs"[tiab] OR "Hospital staff"[tiab] OR "health worker"[tiab] OR "clinical work"[tiab] OR doctor*[tiab] OR "hospitality workers"[tiab]
Web of Science	Needle*[tiab] OR "Needlestick Injuries"[mh] OR "Needlestick Injuries"[tiab] OR Needle Stick*[tiab] OR Needle-Stick*[tiab] OR Needlestick*[tiab] OR Sharps Injur*[tiab] OR "Wounds, Stab"[mh] OR Stab Wound*[tiab] OR Sharp*[tiab] OR "Containment of Biohazards"[mh] OR Biohazard* Containment[tiab] OR Biologic* Containment[tiab] OR Biosafety[tiab] OR "Physical Containment"[tiab] OR "Hazardous Waste"[mh] OR Hazardous Wast*[tiab] OR "Infectious Disease Transmission, Patient-to-Professional"[mh] OR "Patient to Professional Transmission"[tiab] OR "Patient-to-Professional Transmission"[tiab]

Source: Prepared by the authors, 2023.

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Selection of Evidence Sources

After conducting the searches, the identified studies will be imported into EndNote WEB. This reference manager allows for the removal of duplicates. Subsequently, the selection of studies will be performed first from the titles and abstracts according to the eligibility criteria described, using the online platform for systematic reviews, Rayyan QCRI20. This software was developed to streamline the initial screening of abstracts and titles and, subsequently, for the full-text evaluation.

This stage will be carried out by two independent reviewers in a blinded manner, and any disagreements will be resolved by consensus or by a third reviewer. In cases of doubt, the material will be retained for full-text reading, which will provide more elements for the decision regarding the relevance of the material to the review.

All relevant full-text articles will be described in the extraction document and then selected for inclusion in the scoping review. Full-text studies that do not meet the inclusion criteria will be excluded, and the reasons for exclusion will be included in an appendix to the review. The results of the search and study inclusion process will be reported in the final version of the scoping review and presented in a PRISMA extension for scoping reviews flow diagram[8].

Data Extraction

Data will be extracted using the extraction tool in the scoping review approach by JBI[7], adapted to meet the objectives of the scoping review.

For the descriptive mapping, an instrument will be developed in Microsoft Office Excel, with the extracted data including specific details about the participants, concept, context, study method, and key findings relevant to the review question, as shown in Table 2. Initially, an additional pilot will be conducted on the first five articles. The task will be divided between two reviewers. Any discrepancies in the results will be resolved through consensus or by a third reviewer. If an article cannot be retrieved or requires clarification, the review team will contact the corresponding author.

Table 2 – Data extraction tool for studies.

Study identification	
Title	
Year	
Authors	
Country	
Inclusion/Exclusion Criteria	
Population	Healthcare professionals from the hospital network

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Concept	Work-related aspects (work conditions and organization)
	Individual aspects of the injured professional (physical and mental)
Context	Hospital sector where the accident occurred
Details and characteristics of the evidence source (regarding population, concept, and context of the scoping review)	
Objective	
Method	
Participants (age, sex, profession, number of participants)	
Conclusion and recommendations	
Details/results extracted from the evidence sources	
Type of accident	Percutaneous exposure; mucous membrane exposure; exposure to non-intact skin
Biological material	Blood, secretions, bodily fluids, and contaminated items
Accident instrument	Needles, blades, syringes, and others
Aspects related to work conditions	Number of hours worked, rest time, sleep deprivation, physical exertion, work location, schedule, and compensation for task execution
Aspects related to work organization	Task prescription and division, task content, hierarchical system, command modalities, power relations, responsibilities, among others
Aspects related to physical health	Fatigue, tiredness, sleep, exhaustion, musculoskeletal pains
Aspects related to mental health	Stress, anxiety, fear, depression
Limitations	
Conclusion and recommendations	

Source: Prepared by the authors, 2023.

Data Analysis and Presentation

The data extracted from the included studies and unpublished literature will be presented in a narrative summary and in tables, according to the categories listed in the extraction tool. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR)

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will be used to guide the presentation and transparency of the review, as well as the communication of results.

EXPECTED RESULTS

The results of this review will provide a comprehensive understanding of the work-related aspects of healthcare professionals that preceded exposure to biological material, highlighting evidence that is under-explored in the scientific literature.

CONCLUSION

The development of this scoping review protocol is in accordance with the methodological recommendations of the JBI Manual for Evidence Synthesis's Scoping Review and the PRISMA-ScR guidelines. The protocol is ready for execution, and it will be a precursor in providing an overview of the state of accidents involving biological material that are poorly mapped in the evidence base.

It is expected to identify studies that highlight work-related aspects and individual factors that precede accidents involving biological material. This will make it possible to promote knowledge in the area of Occupational Health about factors associated with biological material accidents among healthcare professionals.

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Funding and Acknowledgements:

This study was supported by the Graduate Program in Public Health at the Federal University of Acre. Call for Proposals 38/2022.

Authorship criteria (authors' contributions)

Bandeira TM and Vasconcelos SP contributed substantially to the conception and/or planning of the study; to obtaining, analyzing, and/or interpreting the data; as well as to the writing and/or critical review and final approval of the published version.

Ribeiro TS and Rocha GS contributed to the writing and/or critical review and final approval of the published version.

Declaration of conflict of interest

Nothing to declare.

Scientific Editor: Ítalo Arão Pereira Ribeiro.

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